

WANG

VS

Programmer's Introduction

VS

Programmer's Introduction

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This manual replaces and obsoletes the fifth edition of the *VS Programmer's Introduction* (800-1101PI-05). For a list of changes made to this manual since the previous edition, see the "Summary of Changes".

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PREFACE

This manual introduces the programmer to Wang Laboratories' VS system. It is written for anyone who is at least a junior-level programmer familiar with basic data processing concepts.

After reading this manual and the VS Program Development Tools Reference, you will be able to work with the VS menus and with the Command Processor, and to create, compile and run a program on the VS.

This manual is organized as follows:

- Chapter 1 introduces the VS and explains basic concepts you must understand to use the system
- Chapter 2 describes the VS workstation, and explains how to use the different keys
- Chapter 3 describes the Command Processor (the main means of communication with the system) and contains all the information you need to use it
- Chapter 4 describes VS INFO, an on-line help and information facility
- Appendix A contains the VS workstation character set
- Appendix B describes three kinds of decimal representation commonly used by the VS
- Appendix C describes the VS naming conventions

All new programmers using the VS should read this manual for a general introduction to the system. For detailed information about VS system features and programming languages, consult the following manuals:

VS/IIS Supervisor's Procedures	800-1110-02
VS/WP Introducing Word Processing on the VS	800-1407-02
VS System Administrator's Reference	800-1144-01
VS Network User's Guide	800-1316-03
VS Network Configuration and Operations Guide	800-1317-03
VS Operating System Services Reference	800-1107-04
VS Program Development Tools Reference	800-1307-03

VS System Operator's Reference	800-1102-07
VS System Utilities Reference	800-1303-04
VS Assembly Language Reference	800-1200-03
VS BASIC Language Reference	800-1202-04
VS COBOL Reference	800-1201-05
VS FORTRAN Reference	800-1208-01
VS PL/1 Language Reference Manual	800-1209-02
VS Procedure Language Reference	800-1205-04
VS RPGII Language Reference	800-1203-05

SUMMARY OF CHANGES
FOR THE 6TH EDITION OF THE VS PROGRAMMER'S INTRODUCTION

TOPIC	DESCRIPTION	PAGES
SPOOLIB	The SPOOLIB default parameter of SET Usage Constants is now modifiable.	3-6
SPOOLSYS	If your system is connected through Wang networking, the SPOOLSYS parameter of SET Usage Constants is available for remote print routing.	3-7
PRINTER field	The PRINTER field on the Set Print Mode Defaults screen (SET Usage Constants) has been generalized to provide a new Default Printer Device Number function.	3-8
Manage QUEUES	The name of the command associated with PF4 on the Command Processor menus has been changed from Manage PRINT/PROCEDURE QUEUES to Manage QUEUES.	3-17
	Two new options, the Transmit Queue and the Retrieve Queue, have been added to the Manage QUEUES command.	3-22, 3-23
Manage FILES/LIBRARIES	Two DMS/TX attributes messages have been added to the File Attributes screen, if your system uses the DMS/TX software.	3-31
Manage COMMUNICATIONS	The new Manage COMMUNICATIONS command, associated with PF8 on the Command Processor menu, allows you to view status information about all telecommunication units configured for the system including all remote devices connected by telecommunication lines. This command was previously accessible through Manage DEVICES.	3-45
Send MESSAGE To Operator	This command is associated with PF13 on the Command Processor Menus and allows a workstation message to be sent between user's workstations and an Operator's Console.	3-51
VS INFO	VS INFO, an on-line documentation facility, is now contained in Chapter 4. It was previously included in Chapter 1.	4-1

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CHAPTER 1

INTRODUCTORY CONCEPTS

1.1 SYSTEM OVERVIEW

The Wang VS offers an integrated programming environment which is convenient and easy to use, with software facilities deliberately tailored to accommodate both the technical and nontechnical user. The system offers interactive and noninteractive background processing, large on-line storage capabilities, a variety of languages, and support for multiple users and multiple concurrent job executions. The VS provides the following primary features:

- Interactive Processing

You can communicate with the system in a direct, conversational manner through your workstation. The system communicates by displaying prompts at the workstation screen and you respond, query, and control the system by entering information at your workstation. You can display and review program results and system responses immediately, thus eliminating the traditional wait and delay for printed copy. The system's facilities are easily accessed and used, aiding in all phases of program development, from source code entry to debugging, testing, and execution. Consult the VS Operating System Services Reference or the VS Program Development Tools Reference for further information.

- Noninteractive Background Processing

As an alternative to interactive system communication, you can submit jobs for noninteractive processing, thus freeing both you and the workstation. Once your job is submitted, no further user response is necessary. Submitted jobs are listed in the procedure queue, from which they are controlled and processed. For further information, refer to the VS System Operator's Reference.

- Virtual Memory

The VS offers a technique of memory management known as virtual memory, which utilizes disk storage as an extension of physical memory. The Operating System ensures that only those sections of a program and its associated data used during program execution are kept in main memory, while the remaining unreferenced sections are kept on a disk until needed. This technique provides you with a virtual memory of one million bytes, effectively eliminating the need to modularize or overlay programs. Consult the VS Operating System Services Reference for further information.

- Multiple Users, Multiple Jobs

The VS supports multiple workstations, all of which can run jobs concurrently. The system places no restrictions on the types of jobs which may be run simultaneously from the various workstations. Refer to the VS Operating System Services Reference or the VS COBOL Reference for further information.

- Storage Capacity and Physical Memory

To accommodate varied storage and usage requirements, the VS provides storage capacity of up to 2.3 billion bytes (up to 4.6 for the VS-100) and physical memory of up to 512K bytes (up to 8192K for the VS-100). For further information, refer to the VS Operating System Services Reference.

- Automatic Program Sharing

When two or more users run the same program at the same time, they automatically share the same copy of the program's logic section in memory. This technique eliminates unnecessary duplication and increases total system performance. Refer to the VS Operating System Services Reference for further information.

- Automatic File Sharing

To enable you to perform update and/or inquiry operations on a common file concurrently with other users, the VS provides an integrated shared file capability. In data entry applications, for example, all users can directly update a single master data file simultaneously. The additional steps of creating separate, temporary files for all users, then merging them together, are thereby eliminated.

- Buffering Techniques

The VS utilizes a technique called anticipatory buffer priming, in which data is read into a buffer before it is needed for processing. In this manner, the I/O wait for data is reduced. Additionally, the VS uses a large buffering technique for sequential access. This technique enables many records to be loaded from storage into main memory in one operation, reducing the total number of I/O operations and thus making the system more efficient. Buffer pooling, used for random access efficiency, reduces device I/O by retaining the most recently used data in memory, making it more quickly accessible. Consult the VS Operating System Services Reference for further information.

- Multiple Languages

To facilitate programming flexibility, five high-level, compiled languages are supported on the VS: COBOL, RPG II, FORTRAN4, PLI and BASIC. Also supported are an Assembler language and a system command language called Procedure language.

- VS COBOL and RPG II offer versatile file-handling and output-formatting capabilities which make them particularly beneficial for business and commercial data processing applications.
- VS FORTRAN4 and PLI are designed to facilitate structured programming for scientific data processing applications; PLI accomodates business applications as well.
- VS BASIC is an easy-to-use, general-purpose language which offers both a wide variety of built-in numeric functions and powerful character string manipulation capabilities.
- VS Assembler is a machine-level language providing maximum efficiency and flexibility in the use of the Operating System services.
- VS Procedure language is especially useful for limited interaction and noninteractive processing on the VS.

For further information on these languages, consult their respective manuals.

- Automatic Print Spooling

To improve I/O time, as well as to make more efficient use of workstations and printers, the system provides automatic print spooling. Print spooling is a technique in which printer output is temporarily stored on disk rather than immediately printed. The names of all spooled print files are entered into a print queue and are subsequently printed when a printer becomes available. Print spooling offers the dual benefit of freeing the individual workstation or background program from operating at printer speed and enabling the printers to be scheduled most efficiently to handle the total system requirements. With automatic print spooling, program execution is never held up because a needed printer is busy. Consult Section 1.10, "File Security," for further information.

- Versatile Security System

A multilevel security system, providing security on both the system level and the individual file level, permits protection of the entire system and of individual files from unauthorized users. See the VS System Management Guide for further information.

- Programming Environment

An integrated programming environment is available through the VS system utility programs. These utilities include an interactive text editor for entering, editing, translating, and running programs; a symbolic debug processor for easy identification and correction of program errors; a versatile data entry, file maintenance, and report generation facility; and an assortment of system utility programs, including sort, copy, and link routines. Many of these programming facilities, including the text editor, debug facility, and link utility, are documented in the VS Program Development Tools Reference.

1.2 PROGRAMMING INTRODUCTION

The VS is designed to be an easy-to-use system that is essentially self-documenting. In most cases, all the information you require to perform a particular task is specifically requested by the system program which performs that task in the form of prompts on the workstation screen. There are, however, a number of important basic concepts with which you must be familiar before you can use the system effectively. These concepts include the following:

- Workstations, system users, and the LOGON procedure
- System access via the Command Processor
- Program interruption and the HELP key
- The file management hierarchy (files, libraries, and volumes)
- Default parameter specification and the system program library
- File security
- Noninteractive background processing

The following sections describe these fundamental concepts.

1.3 WORKSTATIONS, SYSTEM USERS, AND THE LOGON PROCEDURE

The Wang VS provides three types of workstation modes for the programmer: user mode, dual mode, and operator mode. User mode gives you access to the system's Command Processor menu, through which you can perform operations such as developing, debugging, and running programs. Operator mode provides access to facilities used for system monitoring and control by an operator, such as interactive device status and control over system devices and functions. Dual mode offers both user mode and operator mode facilities.

User mode is available only after logging onto the system and thus is restricted to system users. Operator mode, however, is directly accessible on both dual mode workstations and Operator's Consoles without logging onto the system. This manual documents only the facilities available to you in user mode. For more information concerning operator mode and the Operator's Console, consult the VS System Operator's Reference.

Access to VS system resources is restricted to those users designated as system users and can be specifically limited through certain security features. Before obtaining access to the system, you must be assigned a unique User ID and password by a system security administrator.

The LOGON display is the first display you encounter at a workstation. You are required to enter your User ID and password, as shown in Figure 1-1. Note that your password is not displayed when you enter it.

*** Wang VS Logon ***		
Workstation 38	9:39 am	Wednesday July 6, 1983
Hello new user		
Welcome to Tech Writing VSJ		
Please identify yourself by supplying the following information		
Your userid = ***		
Your password =		

Figure 1-1. LOGON Screen Format

The entered values are checked against the System User List, and, if they are located in the list and the you have LOGON rights for that workstation, you are immediately logged on the system. Otherwise, LOGON returns a message indicating that you specified an invalid User ID or password or that you do not have system access rights from that workstation. The LOGON prompt remains displayed. If you made an error when typing in either your User ID or password, you can try to enter the correct values again.

The process of logging a new user on the system from a particular workstation involves automatically resetting all default parameters to the system defaults (in effect, deleting any defaults set by the previous user at that workstation) and passing control to the Command Processor. (See Section 1.9, "Default Parameter Specification and the System Program Library," for an explanation of default parameters.) Following a successful logon, the Command Processor menu is displayed on the workstation screen, unless a LOGON program or procedure has been specified for you by the system security administrator (refer to the next section).

1.3.1 Restricting User Access to the System

The system security administrator can specify a particular LOGON program or procedure that is run immediately when you log on the system. Through the use of LOGON programs or procedures, any user can be prevented from accessing the Command Processor, thus restricting access to the system. For more information about LOGON procedures, consult the VS Procedure Language Reference.

In addition to LOGON programs and procedures, the system security administrator can restrict you to (or from) system access at specific workstations. Additionally, you can be restricted from using the HELP Processor (see Section 1.6, "Program Interruption and the HELP Key"). If you are HELP-restricted at a nonoperator workstation, pressing the HELP key causes the workstation alarm to sound; at dual mode workstations, pressing the HELP key in user mode allows direct entrance to operator mode. All IDs, passwords, and access restrictions of all system users are recorded in the System User List which identifies all users who have access rights to the system.

1.4 SYSTEM ACCESS VIA THE COMMAND PROCESSOR

You communicate with the VS by issuing commands which direct the Operating System to perform a variety of tasks. You can use these commands to perform such operations as running programs, setting default parameters, scratching and renaming files, initiating debug processing, and examining various aspects of the system status. You can issue commands interactively at the workstation from the Command Processor menu or through your program. Alternatively, you can write some commands in a special type of text file called a procedure file (written in the VS Procedure Language) and execute them without direct interaction. The command statements by which you can build procedures are discussed in the VS Procedure Language Reference.

You can issue commands interactively from the workstation by selecting from among the options displayed on the Command Processor menu, shown in Figure 1-2.

This screen contains descriptions of the available system commands and associates each command with one of the Program Function (PF) keys on the workstation keyboard (described in Chapter 2). You can select a command simply by pressing the appropriate PF key.

```

*** Wang VS Command Processor ***

Workstation 38 Ready          9:48am          Wednesday July 6, 1983

Hello Joe Sample
Welcome to Tech Writing VSJ

Press (HELP) at Any Time to Interrupt Your Program or to Stop
Processing of the Current Command.

Use the Function Keys to Select a Command:

(1) RUN Program or Procedure      (9) Enter WORD PROCESSING
(2) SET Usage Constants           (11) Enter OPERATOR Mode
(3) SHOW Program Completion Report (12) SUBMIT Procedure

(4) Manage QUEUES
(5) Manage FILES/LIBRARIES        (13) Send MESSAGE To Operator
(6) Manage DEVICES               (15) PRINT COMMAND Screen
(8) Manage COMMUNICATIONS        (16) LOGOFF

```

Figure 1-2. Main Command Processor Menu

The commands available on the Command Processor menu are briefly introduced below and discussed in detail in Chapter 3:

<u>PF Key</u>	<u>Command</u>	<u>Action</u>
1	RUN Program or Procedure	Runs the specified program or procedure. (See Sections 1.5, "Running Programs Interactively from the Workstation," and 3.2, "RUN Program or Procedure.")
2	SET Usage Constants	Permits specification of default values for common parameters: file and library locations, printer output, and noninteractive background job processing. (See Sections 1.9, "Default Parameter Specification and the System Program Library," and 3.4, "SET Usage Constants.")

<u>PF Key</u>	<u>Command</u>	<u>Action</u>
3	SHOW Program Completion Report	Provides information on the total resource requirements of the program or procedure just completed. (See Section 3.5, "SHOW Program Completion Report.")
4	Manage QUEUES	Permits control and manipulation of print and procedure queues. (See Sections 1.8, "Printing Capabilities," 1.11, "Background Processing," and 3.7, "Manage QUEUES.")
5	Manage FILES/ LIBRARIES	Permits examination of the contents of files, libraries, and volumes, as well as scratching, renaming, printing, and protection of accessible files and libraries. (See Sections 1.7, "File Identification and Access on Disk and Tape Volumes," and 3.8, "Manage FILES/LIBRARIES.")
6	Manage DEVICES	Allows viewing of status information about peripheral devices and permits mounting, dismounting, and other device management functions. (See Sections 1.7, "File Identification and Access on Disk and Tape Volumes," and 3.9, "Manage DEVICES.")
8	Manage COMMUNICATIONS	Provides information about all telecommunication (TC) units configured for the system including all remote devices connected by telecommunication lines. (See Section 3.10, "Manage COMMUNICATIONS.")
9	Enter WORD PROCESSING	Allows accessing word processing mode directly from the Command Processor; it is available only if you have Word Processing software on your system. (See Section 3.11, "Enter WORD PROCESSING.")
11	Enter OPERATOR MODE	Allows access of the Operator's Console if you have a dual mode workstation. (See Section 3.13, "Enter OPERATOR MODE.")
12	SUBMIT Procedure	Permits submittal of a procedure to be run in noninteractive background processing. (See Sections 1.11, "Background Processing," and 3.14, "SUBMIT Procedure.")

<u>PF Key</u>	<u>Command</u>	<u>Action</u>
13	Send MESSAGE To Operator	Allows you to send a message to a user at the Operator's Console from your workstation. (See Section 3.15, "Send MESSAGE To Operator.")
15	PRINT COMMAND Screen	Provides a printed copy of any screen accessible from the Command Processor. (See Section 3.17, "PRINT COMMAND Screen.")
16	LOGOFF	Logs you off the system. (See Section 3.18, "LOGOFF.")

When you select a command from the Command Processor menu, one or more prompts are invoked requesting you to enter the parameters required by the selected command. Such prompts and parameter requests eliminate the need for you to memorize complex syntax rules. Similarly, it is not essential that you ensure that all parameters are properly specified. In general, if a parameter is inadvertently omitted or incorrectly specified, the Command Processor simply repeats the prompt with an appropriate error message, so that you can enter the correct value.

When you issue a command or invoke a system program or utility from the Command Processor, the screen that appears may contain a menu of command (and associated PF key) options. A PF key option available through this menu is displayed only when it is viable for the current circumstances. For example, the Manage QUEUES command displays a list of print, procedure, transmit, or retrieve queue entries and a menu of command options. Two options available from that menu are First and Last, which display the first and last screen, respectively, of print or procedure queue entries. These options appear only if more than one screen of entries exists. If the queue entries fit on one screen or less, First and Last do not appear on the menu.

The Command Processor actually has two slightly different versions of its menu. The Main Command Processor menu is displayed whenever there is no program running at the workstation. This provides immediate user access to the system upon completion of any program, so that a new program or command can be initiated at once. If a running program is interrupted prior to completion with the HELP key or as the result of an error, the Command Processor displays a Modified menu (shown in Figure 1-3). The Modified Command Processor menu permits the continuation of program execution or cancellation of the program. In addition, the Modified menu allows the selection of any of the commands available in the Main menu (except the RUN Program or Procedure, Enter WORD PROCESSING, and LOGOFF commands), including a modified PF3 option and the addition of two options, PF10 and PF14 (see Section 1.6, "Program Interruption and the HELP key").

1.5 RUNNING PROGRAMS INTERACTIVELY FROM THE WORKSTATION

The most important and commonly used command on the Command Processor menu is RUN Program or Procedure (RUN), which you can use to run your programs as well as system programs. You can invoke this command by pressing PF1 on the Command Processor menu, which prompts you to specify the name of the program to be run. You must also specify the names of the library and volume in which the program resides if you are running your program. (User libraries and volumes are explained in Section 1.7, "File Identification and Access on Disk and Tape Volumes.") The VS provides an assortment of system utility programs, any of which you can invoke with the RUN command. System programs are stored in the System Program Library. Because the System Program Library is used as a default by the RUN command, it is never necessary for you to specify a library or volume name when running a program contained in the System Program Library. You need only type in the program name and press the ENTER key. If the program requires additional parameters or file specifications, you are asked to enter this information via one or more prompts. (See Subsection 1.7.2, "Files and Libraries," for more information concerning the System Program Library.)

It is important to understand that, although the system can process two or more jobs concurrently from different workstations, a single workstation can perform only one interactive job at a time. (On the VS, a job is a program or series of programs submitted for execution; for example, a background job consists of the series of programs and commands specified within the submitted background procedure.) Only one root program or procedure can be run from each workstation at any time. However, a single root program or procedure which you run may call/link any number of subprograms and subprocedures in the course of execution. (Note the distinction between interactive and noninteractive background jobs: a workstation can process only one interactive job at a time, but more than one background job can be submitted from the same workstation. Background jobs, also, are executed one at a time and do not interfere with interactive workstation use. See Section 1.11, "Background Processing," for more information.)

You can interrupt a program running at your workstation by pressing the HELP key if you wish to select a command from the Modified Command Processor menu. However, the program cannot be continued while the selected command is executing, nor can a second program at the same workstation be run while the first program is interrupted. In order to run a new interactive program, you must terminate the current program either by letting it run to normal completion or by cancelling it manually. For this reason, the RUN command does not appear in the Modified Command Processor menu, which is displayed when a program is interrupted (in this case, RUN Program or Procedure is replaced by the CONTINUE Processing command). Similarly, you cannot log off the system until an interrupted program has completed running or is cancelled. For

this reason, the LOGOFF command is replaced by the CANCEL Processing command on the Modified Command Processor menu. Finally, the Enter WORD PROCESSING command does not appear on the Modified Command Processor menu because the system cannot run the Word Processing program while running another program. For further information about the Command Processor menu, refer to Chapter 3, "The Command Processor."

1.6 PROGRAM INTERRUPTION AND THE HELP KEY

There are two ways in which a running program can be interrupted: automatically by the system itself (due to error) or manually by you. These two types of interruptions are discussed in the following text.

Automatic interruption of a program by the system occurs whenever your program check or an unexpected program execution error occurs. In such cases, you have the option of cancelling the program (by pressing PF16), invoking the Modified Command Processor menu (by pressing HELP), or initiating debug processing (by pressing PF1).

Voluntary interruption of your program occurs when you press the HELP key. The program running at your workstation is immediately interrupted (any current I/O operations are completed), necessary program status information is saved by the system for subsequent program resumption, and the Modified Command Processor menu is displayed. (Note that it is possible to disable the HELP key for specific users, thereby preventing such users from interrupting a program and gaining access to the Command Processor. Refer to Subsection 1.3.1, "Restricting User Access to the System," for further information on HELP-disable.) The Modified Command Processor menu is identical to the main menu with only a few exceptions (discussed in Section 3.1, "Introduction"); the Modified menu is illustrated in Figure 1-3.

*** Wang VS Command Processor ***

Hello Marcia Chen
Welcome to Tech Writing VSJ

Total Elapsed Time = 00:00:02 (HMS) Program Processor Time = 00:00:00 (HMS)

Program EDITOR
Was Waiting for Workstation Attention

Use the Function Keys to Select a Command:

- | | |
|----------------------------|-------------------------------|
| (1) CONTINUE Processing | (10) Enter DEBUG Processing |
| (2) SET Usage Constants | (11) Enter OPERATOR Mode |
| (3) SHOW Program Status | (12) SUBMIT Procedure |
| (4) Manage QUEUES | (13) Send MESSAGE To Operator |
| (5) Manage FILES/LIBRARIES | (14) PRINT PROGRAM Screen |
| (6) Manage DEVICES | (15) PRINT COMMAND Screen |
| (8) Manage COMMUNICATIONS | (16) CANCEL Processing |

Figure 1-3. Modified Command Processor Menu

You can invoke any of the commands displayed in the Modified Command Processor menu while the program is interrupted. Therefore, you can set new default parameters, examine and/or modify the status of peripheral devices and on-line files, and, through the debug processor, examine the program itself and modify variable data values while the program is interrupted. (See Chapter 3, "The Command Processor," for explanations of these options.) When the desired functions have been completed, you can continue program execution from the point of interruption simply by pressing PF1 (CONTINUE Processing).

1.7 FILE IDENTIFICATION AND ACCESS ON DISK AND TAPE VOLUMES

The VS provides a multilevel hierarchy for identifying and storing information on external storage devices such as disks and tapes. A particular collection of related information is stored in a file, which is assigned an alphanumeric name of up to eight characters. The file is assigned to a library, which can contain many files, usually of related contents. A library, also, is assigned an alphanumeric name of up to eight characters. A library resides on a volume, which is an independent storage device (e.g., a disk or tape). Volumes are identified with alphanumeric names of up to six characters. These three hierarchical levels serve to identify individual files and provide flexibility in naming conventions. Volumes, libraries, and files are described in the following subsections.

1.7.1 Volumes

The VS supports disk drives and magnetic tape drives as external storage devices. Each device holds one or more volumes. A volume is an independent physical storage medium, such as a diskette, disk pack, or reel of magnetic tape. Volumes may be permanently fixed in the drive unit (i.e., the fixed platter(s) in a fixed/removable disk drive) or they can be removed from the drive unit and subsequently remounted (i.e., a reel of tape, diskette, or removable disk pack).

Whether it is fixed or removable, every volume used by the system is assigned a volume name unique on that system for that device type; that is, no two mounted volumes on the same VS system can have the same volume name. (However, not all volumes of the same device type, such as tape volumes, contain tables of contents on which to store their assigned volume names.) If the volume is unlabeled, the name is assigned during an initialization process and remains with the volume unless explicitly changed by you (volume names are assigned and changed via the DISKINIT or TAPEINIT utilities; refer to the VS System Utilities Reference). If the volume has a label, the volume name is assigned when the volume is mounted.

Whenever a volume is mounted in a drive unit, the name of that volume is associated with the address of the drive unit. Thus, a volume mounted in any drive unit can be accessed by its volume name, without reference to the address or physical characteristics of the drive unit itself. The volume name provides a device-independent means of identifying and accessing volumes on the system, freeing you from any concern for a volume's physical location.

1.7.2 Files and Libraries

If you want to store information on a disk or tape volume, you must place it in a file. A file is a logical unit consisting of zero or more records. Certain commonly used files are referenced by their type of content; for example, a file containing source program text is known as a source file, or one containing printer text is known as a print file.

Every file on a disk volume is a member of a library. A library is a logical structure which permits several files to be grouped together for the purpose of identification and access. Several files which are related in some way (for example, all program files, all source files, or all files belonging to a particular user) can be assigned to the same library. The VS places no restrictions on which files may be assigned to a particular library; the conventions governing library usage are completely determined at each individual installation, based on its particular needs and standards.

No specific maintenance procedures are required if you create or delete a library. A library is automatically created when the first file is assigned to it and automatically deleted when the last file assigned to it is scratched. A single library (or a single file) cannot exceed volume boundary limitations, though you can create separate libraries with the same name on separate volumes (since the volume names, used for identification, are distinct).

The use of library names provides an additional level of qualification for file identification, permitting the use of duplicate file names on the same volume using different library names. This facility enables you to give related files the same name; the files are identified by the libraries in which they reside. For example, you could give a program file and its corresponding source file the same name and place them in two separate libraries containing object and source files. You then identify the files by both their file and library names. The following examples illustrate the flexibility of naming conventions in the file identification hierarchy for a hypothetical system:

<u>Volume</u>	<u>Library</u>	<u>File</u>
VOL001	MBCCOPY	TESTPROG
VOL001	MBCOBJ	TESTPROG
VOL001	MBCOBJ	SAMPLE
VOL005	MBCOBJ	SAMPLE

In general, whenever a file is opened, you must specify the name of the file itself, the name of the library to which the file is assigned, and the name of the volume on which the library resides. This holds equally true for program files, which you must identify for the RUN command of the Command Processor when a program is run (refer to Chapter 3). An exception exists, however, in the case of system programs (which include all system utilities and compilers); usually, only the file name is required. (For further information on running system programs, refer to Subsection 1.9.2, "The System Program Library.")

The Data Management System (DMS), an integral component of the VS Operating System, creates and maintains files and libraries on disk and tape volumes. DMS handles all the complex "housekeeping" tasks associated with file maintenance and space allocation on external storage devices. DMS performs all physical I/O operations to the external devices and controls the physical location of information on each volume. Thus, you need only be concerned with the logical organization of information in a manner most suitable to their particular applications.

There are two specific types of files created on the VS for which you can specify default volumes: print files and work files. Print files are disk files that contain the output sent to a printer by a program and are usually stored (i.e., by default unless you specify otherwise) in your print library (with the exception of on-line print files; see Section 1.8, "Printing Capabilities"). Work files, discussed below, are temporary disk files used by the system during program editing, compilation, and execution.

Work Files

Work files are temporary disk files used by programs for internal processing only, and are created, named, and deleted after use by the Operating System. Work files are stored in your work library(s) and their existence is generally transparent. You can have two possible work libraries: one for interactive processing and one for noninteractive background processing. The work library names are supplied by the system and are discussed in Appendix C, "VS Naming Conventions."

If you specify a work volume, a work library is created on that volume; otherwise, a work library is created on a volume selected by the system. (Print files, and work files, libraries, and volumes are specified via the SET Usage Constants command of the Command Processor, described in Chapter 3.)

1.7.3 Disk Volumes

In addition to the files stored on it, a standard disk volume contains a label and a Volume Table of Contents (VTOC). The label includes the volume name. The VTOC contains a listing of the names, locations, and attributes of all files on the volume and the libraries to which the files are assigned. When a specified file must be located, the system (DMS) will search the VTOC for the appropriate library rather than the entire volume.

A disk volume is divided into a number of physical records called blocks, each 2048 (2K) bytes in length. When a file is created, DMS automatically allocates enough space for the file by reserving a number of contiguous blocks on the disk volume. A group of contiguous blocks allocated for use by a particular file is referred to as an extent. A group of contiguous blocks which is not allocated to any file is called a free extent. If a disk volume contains only one file, that volume has two extents: one extent consisting of all blocks allocated to the file and one free extent consisting of all remaining, unused blocks on the volume. If, during volume initialization, a defective block is found in the free extent, the block is removed and the extent is divided in two. For example, if Block 500 is defective of 1,000 blocks in a free extent, that extent is then divided into an extent of Blocks 1-499, and extent of Blocks 501-1000.

If a file outgrows its initially allocated space, DMS will automatically locate additional space on the volume and allocate it to the file. (DMS can allocate a total of 13 extents to any one file: up to three extents can be allocated at file creation and up to 10 in secondary allocations. If file creation requires more than three extents or the total of 13 extents is to be exceeded, a Boundary Violation occurs.) If the only available free extent is too large for the file's needs, DMS splits the extent into two, allocating one extent to the file and leaving the other free. When extents are freed, DMS automatically combines them.

By splitting or grouping free extents as necessary, DMS makes the most efficient use of available disk space. Conversely, if you scratch a file, DMS automatically deallocates all extents used by the file, combines contiguous free extents, and designates the free extents as available to other files. The process of allocating and deallocating extents on a disk volume is handled completely by DMS and is transparent to you.

In general, you need not be concerned with the problem of obtaining additional space for expansion of a file, unless the volume itself is full or the file outgrows its initial extent by a very large margin. In some cases, a file which is expanded significantly beyond its initially estimated size may exceed its maximum allowed total of 13 extents before it runs out of disk space. One way to avoid the problem of running out of extents for a file is to follow a regular schedule of backing up and restoring volumes with the BACKUP utility. (BACKUP automatically consolidates all extents used by a file into a maximum of three extents. See the VS System Administrator's Reference for further discussion of BACKUP.)

Information on the number and sizes of extents used by each file and the number and sizes of the 20 largest free extents available on a volume is stored in the VTOC. You can display this information at the workstation with the Manage FILES/LIBRARIES command of the Command Processor (described in Section 3.8, "Manage FILES/LIBRARIES"). For further information on disk volume structure, consult the VS Operating System Services Reference.)

1.7.4 Tape Volumes

Magnetic tape drives, unlike disk drives, support only sequential file organization. Tape volumes may contain a tape label (which includes, among other things, the volume name) and header/trailer markers for each file, but no VTOC. (The VS supports IBM-labeled, ANSI-labeled (standard), and nonlabeled tapes.) Thus, files stored on a tape must be written and accessed sequentially and are separated by tape marks. Each additional file written to a tape is added after the last tape mark.

The VS provides two techniques for identifying tape files: the use of file and library names (if the tape is labeled), and the use of a file sequence number. If you specify a file name to access a file, the tape must be searched sequentially to locate the named file. A file sequence number specifies the ordinal position of the file on the tape volume. (For example, the file sequence number of the first file on the tape is 1; of the second, 2; and of the fifth, 5.) Files are thus located by the order in which they were written to the tape. If you specify both a file name and a sequence number, the name of the file at that ordinal position is verified as the designated file name.

1.8 PRINTING CAPABILITIES

The VS provides versatile, easy-to-use printing capabilities which enable you to select printing techniques specifically suited to your individual requirements. These printing capabilities are available under both system and user program control, and include such features as optional automatic printing. There are three basic methods for the handling of print output. When output from a user or system program is destined for a printer, the output is intercepted by DMS and handled according to one of the following techniques:

- The output is stored on disk temporarily, and the VS automatic print spooling system controls it for printing by a local printer or an activated remote printer.
- The output is stored indefinitely on disk.
- The output is sent directly to a printer.

These three methods enable you to obtain printed copy immediately, only when desired, or not at all if no printed copy is desired.

The VS automatic print spooling system provides the advantage of freeing you and your workstation for interactive use while the system controls the print file. (Any print output sent to disk is stored in a print file.) All print files controlled by the spooling system are listed in a table of files known as the print queue. The print queue is accessible to all users, and displays many characteristics of each listed print file, as well as offers certain manipulation options. You can specify that a queued print file be printed automatically from the queue as soon as a printer is available, or that it be held in the queue until you release it for printing.

The two other methods of handling print output also have advantages. Print files retained on disk but not controlled by the spooling system provide you with the option of storing print material without cluttering the print queue. Similarly, direct printing never affects the print queue or disk storage, and provides you with immediate hard copy.

The manner in which print output is handled by the system is determined by the print mode that you assign to that output when it is created. There are four print modes, corresponding to the printing techniques previously discussed:

<u>Print Mode</u>	<u>Action</u>
H (Hold)	Print output is placed in a print file and assigned to a library on disk. Control of the print file is transferred to the print spooling system, which places an entry for the file on the print queue in a hold status pending user action.
S (Spool)	Print output is stored in a print file and assigned to a library on disk. Control of the print file is then transferred to the print spooling system, which places an entry for the file on the print queue. The print file is printed automatically on an appropriate printer by the system as soon as the printer is available.
K (Keep)	Print output is stored in a print file and assigned to a library on disk. Control of the file is <u>not</u> passed to the print spooling system, however, and no entry is placed on the print queue. You can print the print file using the PRINT utility (see the <u>VS System Utilities Reference</u>).
O (On-line)	Print output is sent directly to the designated on-line printer. The output is neither stored on disk nor controlled by the spooling system.

Figure 1-4 illustrates a schematic representation of the four print modes.

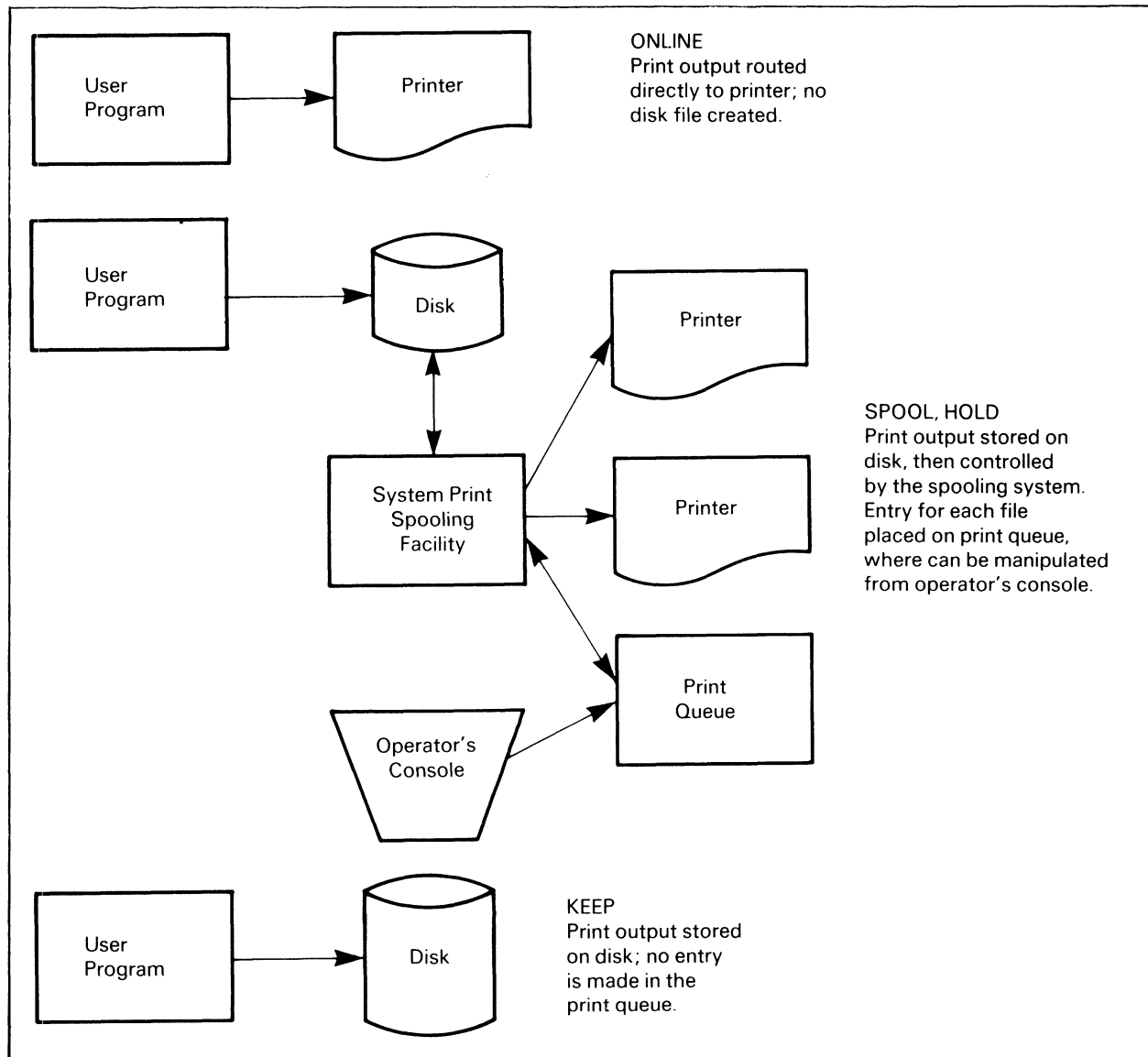


Figure 1-4. Schematic Representation of Print Modes

You can set a default print mode value for the current workstation session through the SET Usage Constants command. This default value is used for all print output created by default. For example, if the default print mode is H, all print output created during such routines as compilation are stored on disk as print files and their entries held on the print queue until you specify otherwise. For print output not created by default or for which no default print mode exists, you can specify a print mode when the file is created.

As with print modes, you can specify a print file name and location for any stored print files not created by default. If you do not supply a print file with file name, the file is assigned a unique name by the system, and is placed in a print file library created by the system unique to you (see Appendix C, "VS Naming Conventions," for information on the names of these files and libraries).

For additional information on print modes and the print queue, consult Subsection 3.7.1, "Controlling the Print Queue." For further discussion of print files and print spooling, consult the VS System Operator's Reference.

1.9 DEFAULT PARAMETER SPECIFICATION AND THE SYSTEM PROGRAM LIBRARY

The system minimizes the number of keystrokes required to specify runtime parameters for system functions and utilities by supplying default parameters automatically wherever possible. This approach saves you time and reduces the probability of typing errors. Whenever a prompt requesting parameters is displayed, all default values are also displayed for your inspection. Parameters may be left with their default values, or you may change them by entering new values. Therefore, you always have the option of accepting the displayed defaults provided or specifying your own parameters.

1.9.1 Specifying Usage Constants

You can specify default values for certain commonly used parameters called usage constants with the SET Usage Constants command. This command, invoked from the Command Processor, enables you to specify default names for commonly used libraries and volumes. You can also specify a default file protection class, various print mode options, and certain background job submittal parameters. Whenever prompts are encountered requesting specification of any parameters for which you specified default values via SET Usage Constants, the specified default values are displayed in the prompts. (For further information, refer to Section 3.4, "SET Usage Constants.")

For example, whenever you attempt to open a file, a file specification prompt is displayed, requesting you to enter the file name and the library and volume names to which the file is assigned. If you specified default libraries and volume names with SET Usage Constants, the appropriate names are automatically supplied as defaults in the prompt. If the file you open is an output file, the default names for the output library and output volume are supplied; if you open an input file, the default names for the input library and input volume are supplied, etc. In every case, you can modify the default names when the prompt is displayed.

1.9.2 The System Program Library

In the case of system program files, the system provides an additional level of default capability (after examining any SET Usage Constants values). System programs are assigned to the System Program Library, which always resides on the System Volume. The System Program Library and Volume are used automatically as defaults by the RUN command whenever the named program cannot be found in your library and whenever no other library name is supplied. (Note that the names of the System Program Library and its associated volume are not displayed in the RUN prompt. If you do not supply a library and volume, the library and volume name fields remain blank.) Thus, when you run a system program, you need only supply the program file name. You can omit the names of the library and volume, and the system will automatically use the System Program Library. This feature enables you to run system utility programs without specifying a library or volume name, or ever having to know those names.

If you specify default names for program library and volume through SET Usage Constants, you do not need to change or erase these names when running a system utility program. The RUN command first checks your program library for the specified program. If the program is not found there, the system then automatically checks the System Program Library. Thus, you can run a system utility program without entering a program library or volume name, whether or not the defaults you specify for these names appear in the RUN prompt (if the file name is not listed in the your library, if displayed).

1.10 FILE SECURITY

The VS security system provides a multilevel security system for the protection of both system and individual files. On the system level, access is restricted to you and other users having LOGON rights. Volume access also can be restricted by mounting a volume exclusively. On the file level, the system provides for the establishment of a number of different file protection classes to which individual program and data files can be assigned. Every system user is granted access rights to one or more of the defined file protection classes by a System Security Administrator. You can obtain access only to files in the protection class or classes to which you have access rights. System Security Administrators thus have great latitude in determining which users will have access to particular files.

The security system is documented for system security administrators in a separate manual, the VS System Administrator's Reference. A general discussion of how the security system works is provided below, since you must assign files to appropriate file protection classes when those files are created.

1.10.1 File Classes

The file class to which a file is assigned is designated by a 1-character file class protection code. The system provides a total of 30 unique file class codes:

<u>Code</u>	<u>Definition</u>
Letters A - Z	Defined by system security administrators and are therefore unique for each installation.
Space ()	Unprotected class; all system users, irrespective of their designated access rights, have access to files in this class.
Number sign (#)	Private class; only the file's owner of record (i.e., the user who created the file) and system security administrators can access a file in this class. All other users are prevented from accessing such a file, irrespective of their designated access rights.
Currency symbol (\$)	Provides read-only access; all users may read and execute the file, but only the owner of record and system security administrators can write to it.
At sign (@)	Permits execute-only access; all users may execute the file, but only the owner of record and system security administrators can read the file or write to it.

File classes associated with the space, number sign, currency symbol, and at sign are defined by the system and are the same in all installations.

1.10.2 User Access Rights

At the time you are assigned a User ID and password, a system security administrator determines which file classes you can access. You may, for example, be granted access only to file classes A, B, and C, or X, Y, and Z. (The meanings and limitations of these classes must be predefined by the administrator at each installation.) Whenever a new file is created, one of the parameters requested is the FILECLAS for that file. FILECLAS is a 1-character field into which a file class code is entered. You can specify the default value for this field with the Set Usage Constants command. If not specified, the value is blank (); thus, files not assigned to specific file classes are unprotected (i.e., accessible to all users).

Once you assign a file to a file class, only you (the file's owner of record) and users with access rights to that class can obtain access to the file. In addition, only you and the system security administrator can reassign a file to another class. You can use the PROTECT option of Manage FILES/LIBRARIES to modify the FILECLAS parameter of a file and assign the file to a different file class. Within a file protection class, various levels of access rights can be defined, including execute access, read-only access, and write access. If you attempt to perform an operation on a file that is not permitted under your access rights, the system displays a warning message and terminates the attempted access operation.

1.10.3 Program Access Rights

Programs, like users, can access only those files to which they have access rights. By default, programs have no access rights unless such rights are explicitly assigned by a system security administrator. In normal execution, therefore, a running program can only access those file classes to which you have access rights. However, in some cases, it is desirable to grant special access rights to a program independent of those held by you or a user who runs the program. (A program used to back up disk files, for example, must be able to read all files.) For such cases, a system security administrator must grant access privileges to the program via the SECURITY utility (see the VS System Administrator's Reference).

An executing program which has been granted special access rights assumes both its own and your access rights while the program is running. (You cannot, however, carry the program's rights outside of the program, say, to the Modified Command Processor.) Thus, if you have access rights to file classes A, B, and C and you run a program which has access rights to file class D and the program attempts to open a data file in class D, the file can be opened. However, a file in file class E cannot be opened since neither you nor the program have access rights file class E, and the system displays a warning message if access is attempted.

1.11 BACKGROUND PROCESSING

In addition to interactive processing, the VS provides a noninteractive, background processing environment. A background job consists of one or more programs and procedures run without user intervention by a controlling procedure. (For a discussion of procedures, see the VS Procedure Language Reference.) You can submit a background job directly from the Command Processor or through an Assembler language routine, or run a background job on a completely time-independent, noninteractive basis. Once submitted, a background job is transferred to the control of the system, which places an entry for that job on a list of background jobs called the procedure queue. The workstation from which your job is submitted is thus freed for interactive operation or for submittal of more background jobs.

Background jobs are run one at a time and are not associated with any workstation. Since they are noninteractive, background jobs must be fully parameterized (i.e., no workstation I/O transactions may be attempted by any background job). Background processing is therefore particularly useful for jobs, such as data sorting and report generation, that can be fully parameterized and normally require long periods of noninteractive workstation time.

1.11.1 Background Procedures

All background jobs run on the VS must be controlled by procedures. A procedure is a set of commands written in the VS Procedure language (see the VS Procedure Language Reference). A background procedure runs one or more background programs and supplies all parameters required for those programs. The use of procedures in background processing allows related programs to be executed in a specified order as one job.

You can use all available procedure statements in background procedures; however, since background jobs are noninteractive, a background job cannot attempt to generate a screen transaction. Therefore, all programs run by a background procedure must be fully parameterized. Any background program attempting workstation I/O results in immediate abnormal termination of that background job.

1.11.2 Submitting a Job

You can submit a background job through the SUBMIT Procedure command (PF12) on the Command Processor menu or the SUBMIT SVC in an Assembler program. To submit a job, you specify the name, library, and volume of the controlling procedure for the job, as well as certain other parameters concerning its execution, including a dump specification, a CPU time limit, and whether the job will be run automatically or held on the procedure queue until you release it for execution. (See Section 3.14, "SUBMIT Procedure" for detailed explanations of these job submission options.) All aspects of the job request, such as checks on your access privileges, are validated when you submit the job. Programs or commands executed as part of a background job receive the same access rights as your access rights.

1.11.3 The Procedure Queue

Once you submit a job for background processing, the job is transferred to the control of the system, which places an entry for that job onto the procedure queue. The procedure queue is a list of all submitted background jobs, and includes specific information concerning each submitted job. As with print files in the print queue, jobs in the procedure queue are either run automatically by the system, or held in the queue until you release it for execution, depending upon the specific status of the job. The procedure queue is accessible to all users by pressing PF4 from the Command Processor at user workstations and through the Operator's Console menu for dual mode or dedicated operator workstations.

In user mode, you can modify certain characteristics of procedure queue entries for jobs you submit. You cannot, however, modify the entries for jobs submitted by other users. You can lower (but not raise) the position of your job in the queue, a capability which allows you and other users to determine the relative sequence in which the jobs are to be run. Manipulation of the entire procedure queue is possible only from the Operator's Console menu in operator mode. (See the VS System Operator's Reference for a discussion of the procedure queue manipulation facilities available in operator mode.)

1.11.4 Job Termination

A background job runs to completion unless it is cancelled due to the occurrence of one of several special conditions, listed below. Upon normal termination, a job is normally removed from the queue. (You can specify that a job be automatically requeued after it is run. See Subsection 3.7.2, "Controlling the Procedure Queue.") Any printer output produced by the job is placed in the print queue. Abnormal termination can occur in any of the following ways:

- Automatically, due to attempted workstation input/output.
- Automatically, due to an exit specified within a program run by the procedure.
- Via operator command, due to a possession conflict.
- Via operator command, due to a specified volume which was not mounted when opening a file.
- Optionally by the operator from the Noninteractive Task display on the Operator's Console menu (see the VS System Operator's Reference).
- Either automatically or optionally, due to a CPU time limit imposed at the time the job was submitted.

For all abnormal job termination, a one-page "indicative" dump is automatically spooled to a printer. This dump contains debug information similar to that of the interactive debug processor screen (see the VS Program Development Tools Reference). You can also request that a full dump be printed upon abnormal termination of the job (see Section 3.14, "SUBMIT Procedure.")

CHAPTER 2

THE VS WORKSTATION

2.1 INTRODUCTION

The VS workstation is an interactive terminal which allows you to communicate in a conversational manner while developing and running a program on the VS. The workstation is a console unit composed of a Cathode Ray Tube (CRT) which is used by the system to communicate information to you, and a keyboard by which you enter information and respond to system prompts. Figure 2-1 illustrates the VS workstation keyboard. This chapter provides you with an operational overview of the workstation, and provides enough information to communicate with the system and run programs from the workstation. All VS compiler languages offer special extensions for formatting the workstation screen and receiving user-entered data; these extensions are described in the individual language manuals.

2.2 THE CRT

The workstation screen or CRT is capable of displaying 24 rows of 80 characters each. (Refer to Appendix A for the complete set of displayable characters.) Brightness and contrast controls enable you to adjust the screen for optimal visibility in different lighting conditions. The cursor, a special symbol resembling a blinking double underscore, is displayed beneath a character position to indicate where the next character entered from the keyboard will be displayed. If the cursor does not appear on the screen, the keyboard is locked and nothing can be entered.

2.2.1 Screen Formatting

One of the more important features of the workstation screen is the ability to format the screen into distinct fields. A field is a discrete region of the screen to which you can assign specific attributes. Some of the attributes that you can specify for a field (one from each column for a given field) are summarized below:

<u>Protection</u>	<u>Display Intensity</u>	<u>Usage</u>	<u>Underscore</u>
modifiable	bright	alphanumeric	line
protected	dim	(upper/lowercase)	no line
	blinking	alphanumeric	
	no-display	(uppercase only)	
		numeric only	

Under program control, fields can be defined on the screen, using special field control characters called Field Attribute Characters (FACs). By convention, field attributes are set as follows.

Protected fields (not user modifiable)	In all system menus and prompts, protected fields are displayed with low intensity. Protected fields are used to display information or instructions.
Modifiable fields	Modifiable fields are displayed with high intensity. In addition, all blank characters are displayed as pseudoblanks (solid blocks). Modifiable fields are used to receive user entry. As you enter data into a modifiable field, the default values and/or pseudoblanks are replaced by the entered characters.
Blinking	Modifiable fields are blinked to indicate a field in error. Protected fields are sometimes blinked to call attention to error messages.

2.2.2 Tabs

There are a total of 10 tabs, which you can set to any column on the workstation screen. You can set and reset the tabs for certain programs, or they can be set and reset by a system program or an application program. You can also set tabs manually for text entry applications with the SET TABS option of the EDITOR program. Default tabs are set automatically by the EDITOR for each language (see the VS Program Development Tools Reference).

2.2.3 Audio Alarm

The VS workstation features an audio alarm that produces a short beep whenever you attempt an illegal data entry operation. Illegal operations include attempts to enter data in a protected field, to move the cursor beyond the screen with a field-sensitive key, or to enter data while the keyboard is locked. The audio alarm is under program control and may thus be sounded by an application program whenever the programmer wishes to alert you.

2.2.4 Visual Controls

You can modify screen display intensity (brightness) and screen character contrast (contrast) by using the two knobs located to the right of the workstation screen.

2.3 THE KEYBOARD

The workstation keyboard, shown in Figure 2-1, is your primary means of communicating information to the system. The keyboard keys are divided into the following functional groups:

- Data entry keys
- Cursor-positioning keys
- Special-purpose keys
- System communication keys

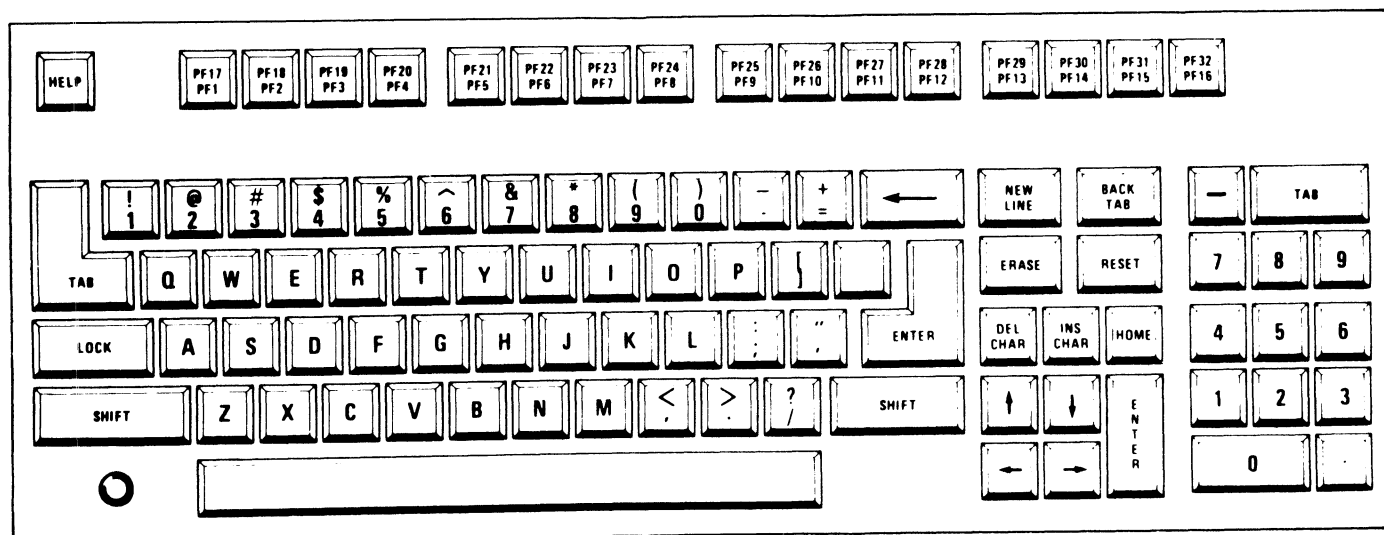


Figure 2-1. The VS Data Processing Workstation Keyboard

2.3.1 Data Entry Keys

The data entry keys provide the means for entering data at the current cursor position on the workstation screen. You must, however, position the cursor within a modifiable field; otherwise, the keystroke is not honored and the alarm is sounded. The data entry keys include the following.

Normal Character Keys	Include the letters, numbers, and special characters. These keys generally function exactly as typewriter keys; use SHIFT and LOCK to obtain uppercase letters and symbols. If you position the cursor in a numeric-only field and strike any key other than (0-9), (-), or (.), the alarm sounds and the keystroke is not honored. When the cursor is in the last position of a field and you strike one of the character keys, the character is entered at that location and the cursor is automatically positioned at the next modifiable field (even if this involves skipping one or more lines or columns).
ERASE	Sets to blanks the cursor location and all locations following it within the same field. Locations preceding the cursor are not changed. The cursor is not moved.
INS (insert) CHAR	Inserts a blank in the display at the current cursor position and automatically shifts all characters in the current field one location to the right, starting at the current cursor position. If the last character in the field is a blank or pseudobank, this character is lost. If the last character is not a blank or pseudobank, the keystroke is not honored and the alarm sounds.
DEL (delete) CHAR	Deletes the character at the current cursor position and shifts all characters in the field one location to the left after the current position. A blank is inserted in the last position in the field.

2.3.2 Cursor-Positioning Keys

Cursor-positioning keys are used to move the cursor to a desired location on the screen. They consist of two types: non-field-sensitive and field-sensitive.

Non-Field-Sensitive Cursor-Positioning Keys

These keys position the cursor without regard for the presence of particular fields. You can use these keys to position the cursor at any location on the screen. There are four keys in this group; all provide the automatic repeat feature, which causes keystrokes to be entered continually while the key is pressed:

Up arrow	Moves the cursor up one row in the same column. If positioned in the top row, the cursor moves to the bottom row in the same column.
Down arrow	Moves the cursor down one row in the same column. If positioned in the bottom row, the cursor moves to the top row in the same column.
Right arrow	Moves the cursor one location to the right in the same row. If positioned at the end of a row, the cursor moves to the beginning of the next row. If positioned at the end of the bottom row, it moves to the beginning of the top row.
Left arrow	Moves the cursor one location to the left in the same row. If positioned at the beginning of a row, the cursor moves to the end of the preceding row. If positioned at the beginning of the top row, it moves to the end of the bottom row.

Field-Sensitive Cursor-Positioning Keys

These keys normally move the cursor two or more positions with a single keystroke. They are used to position the cursor at a new field or new line; they are especially useful in data entry, since they always position the cursor at a modifiable location. There are four keys in this group:

TAB	Positions the cursor at the next tabable position on the screen. A tabable position is either the first character of a modifiable field, a preset tab column within a modifiable field, or the first character of a protected numeric-only field. If you position the cursor at the last tabable location on the screen, the alarm sounds and the cursor does not move.
BACK TAB	Positions the cursor at the closest first byte of a modifiable field preceding the current cursor location. If you position the cursor in a modifiable field and in other than the first location, the cursor moves to the start of that field. If there is no preceding modifiable location, the alarm sounds and the cursor does not move.
NEW LINE	Advances to the first position of the next line and positions the cursor at the first tabbable position at or following the start of the line. You may therefore position the cursor several lines from the original position. If there is no modifiable location at or following the start of the next line, the alarm sounds and the cursor does not move.

HOME Positions the cursor at the first tabbable location on the screen. If there is no modifiable location on the screen, the alarm sounds and the cursor does not move.

2.3.3 Special-Purpose Keys

There are three keys used for special, noncategorized actions:

SHIFT Generally causes the same action as it does on a typewriter. For keys with uppercase and lowercase characters on the key face, SHIFT always determines which of the two characters is entered. For keys with only a single character on the key face, SHIFT has no effect.

SHIFT also has no effect when you enter letters into a field designated as uppercase only. In this instance, uppercase letters are entered irrespective of whether SHIFT is pressed. A small lamp immediately to the left of SHIFT is lighted whenever you press SHIFT. Pressing SHIFT when the keyboard is locked in uppercase turns the SHIFT lamp off and unshifts the keyboard.

LOCK Causes the keyboard to behave as if SHIFT is continuously pressed. When pressed, LOCK causes the SHIFT lamp to be lighted. Pressing LOCK again does not unlock the keyboard; pressing SHIFT, however, turns off the SHIFT lamp and unlocks the keyboard.

RESET Causes all Field Attribute Characters on the screen with a blink indication to be reset to high-intensity, nonblinking. RESET is effective even when the keyboard is locked.

2.3.4 System Communication Keys

All the keys previously discussed operate exclusively on the contents of the workstation screen; they do not affect the contents of memory or any external files. A special group of keys enables you to communicate interactively with the system, indicate that the controlling program may now process the data entered, or request special assistance from the system. Each of these special keys presents an interrupt to the system, requesting the system to service the workstation at once. In addition, a special control character called Assistance ID (AID) is generated by each of the system communication keys. This character identifies the key you use to initiate the interrupt. It can be examined under program control.

When you press a system communication key, all keys (except RESET and HELP) are locked and the cursor is removed from the screen. If you press any one of the locked keys, the alarm sounds. The system communication keys are:

ENTER	The normal means of terminating user entry and requesting the program to process data. SHIFT does not affect the action of ENTER, and ENTER is not honored while the keyboard data entry keys are locked.
PROGRAM FUNCTION (PF)	The 16 PF keys act the same as the ENTER key, except that each key generates a unique character. A controlling program can therefore examine the character to determine which PF key was struck. The values of the PF keys are affected by SHIFT: the lowercase values are PF1 through PF16 and the uppercase values, PF17 through PF32.
HELP	Invokes the Command Processor menu on your workstation. HELP remains active even when the data entry keys are locked and may be used at any time to interrupt a running program and obtain access to the Command Processor menu. (HELP is not active if you have been HELP-disabled by an operator or a system security administrator; see the <u>VS System Administrator's Reference</u> and the <u>VS System Operator's Reference</u> .) HELP does not alter the status of the interrupted program, nor does it cause information which has been entered into the display to be released for processing. (The screen contents are saved in a work buffer and returned to the screen when normal processing is resumed.)

CHAPTER 3

THE COMMAND PROCESSOR

3.1 INTRODUCTION

You can communicate with the VS by means of commands, which you can issue either interactively from the workstation or write in a program-like sequence of statements called a procedure. Interactive communication from the workstation involves issuing commands through the Command Processor. These commands are the subject of this chapter.

To communicate interactively with the system, you select commands from the Command Processor menu. This menu contains a description of each available command and assigns each command to a Program Function (PF) key. To issue a command, simply press the appropriate PF key.

Pressing a PF key executes the associated command. The system then displays prompts which request parameters required for that command. The system provides defaults for many parameters, and you can leave them unchanged or modify them on the screen. When the parameters specified in a prompt are acceptable, simply press ENTER to pass those parameters to the system.

The commands available from the Command Processor menu permit you to initiate a variety of functions including:

- Interactively running both user and system programs
- Continuing or cancelling program execution
- Setting default parameters
- Controlling print, procedure, transmit, and retrieve queues
- Locating, protecting, scratching, and renaming files and libraries
- Examining and modifying the use of system resources
- Managing all devices available to the system
- Managing telecommunication (TC) units configured for the system
- Entering Word Processing if you have word processing software
- Entering Operator mode if you have a dual mode workstation
- Submitting jobs for background processing
- Sending a message to the Operator's Console
- Printing program and command screens
- Performing debug processing
- Logging off the system

However, the commands that perform these functions are not all available at the same time. There are two slightly different versions of the Command Processor menu:

- The Main menu first appears following the Logon procedure; it also appears after the completion of any program, procedure, or command.
- The Modified menu is displayed whenever a program is interrupted.

Figures 3-1 and 3-2 illustrate these two menus.

```
*** Wang VS Command Processor ***

Workstation 38 Ready          9:48am          Wednesday July 6, 1983

      Hello Joe Sample
      Welcome to Tech Writing VSJ

      Press (HELP) at Any Time to Interrupt Your Program or to Stop
      Processing of the Current Command.

      Use the Function Keys to Select a Command:

(1) RUN Program or Procedure      (9) Enter WORD PROCESSING
(2) SET Usage Constants           (11) Enter OPERATOR Mode
(3) SHOW Program Completion Report (12) SUBMIT Procedure
(4) Manage QUEUES
(5) Manage FILES/LIBRARIES        (13) Send MESSAGE To Operator
(6) Manage DEVICES               (15) PRINT COMMAND Screen
(8) Manage COMMUNICATIONS         (16) LOGOFF
```

Figure 3-1. Main Command Processor Menu

*** Wang VS Command Processor ***

Hello Joe Sample
Welcome to Tech Writing VSJ

Total Elapsed Time = 00:00:02 (HMS) Program Processor Time = 00:00:00 (HMS)

Program EDITOR
Was Waiting for Workstation Attention

Use the Function Keys to Select a Command:

- | | |
|----------------------------|-------------------------------|
| (1) CONTINUE Processing | (10) Enter DEBUG Processing |
| (2) SET Usage Constants | (11) Enter OPERATOR Mode |
| (3) SHOW Program Status | (12) SUBMIT Procedure |
| (4) Manage QUEUES | (13) Send MESSAGE To Operator |
| (5) Manage FILES/LIBRARIES | (14) PRINT PROGRAM Screen |
| (6) Manage DEVICES | (15) PRINT COMMAND Screen |
| (8) Manage COMMUNICATIONS | (16) CANCEL Processing |

Figure 3-2. Modified Command Processor Menu

The Modified menu differs from the Main menu in the commands issued from five separate PF keys. In the Main menu, the RUN Program or Procedure command is assigned to PF1 and the LOGOFF command to PF16. In the Modified menu, the CONTINUE Processing command replaces RUN Program or Procedure and the CANCEL Processing command replaces LOGOFF. Consequently, it is impossible for you to run another program or log off the system while a program is suspended. Similarly, PF3 on the Main menu displays the SHOW Program Completion Report command; on the Modified menu, it displays SHOW Program Status for an interrupted program. The Modified menu also provides two additional commands: The Enter DEBUG Processing command, which initiates debug processing on interrupted programs, and PRINT PROGRAM Screen, which allows you to obtain a hard copy of an interrupted program's current screen. Enter WORD PROCESSING, which is assigned to PF 9 on the Main menu, does not appear on the Modified menu.

On dual mode workstations, the Enter OPERATOR Mode command is associated with PF11 on both the Main and Modified menus. Operator mode is introduced in Section 3.13, "Enter OPERATOR Mode," and documented in the VS System Operator's Reference.

All the commands on both menus are discussed in the order of their PF keys in the following sections of this chapter.

3.2 RUN PROGRAM OR PROCEDURE

RUN Program or Procedure is associated with PF1 on the Main Command Processor menu. This command runs a user or system program or procedure; it also loads a program for interactive debugging.

When you press PF1, the system displays the RUN screen requesting the information necessary to identify the program or procedure; Figure 3-3 illustrates this screen. You supply the following parameters (unless defaults were already set):

PROGRAM	The name of the program object file or procedure
LIBRARY	The name of the library containing the specified program file
VOLUME	The name of the volume containing the specified library

*** Run ***

Supply the Name of the Program
(or Procedure) to be Executed
and Press (ENTER):

PROGRAM = PITEST**

Options -

Designate a User Library which
Includes Programs (or Procedures)
to be Used During This Run:

LIBRARY = CJMOBJ**
VOLUME = NEWSYS

or Press (1) to Load Program for Interactive Debug

Press (HELP) to Return to the Command Processor

Figure 3-3. RUN Screen Format

For user programs, you must enter the names of the library and volume containing the program file. If you used the SET Usage Constants command (described in Section 3.4) to specify values for RUNLIB and RUNVOL, these values will appear as default parameters for this command.

For system programs, you need not specify library and volume names; you may either leave these parameters blank or ignore any defaults that appear. When executing these RUN commands, the system searches for the program first in the specified library, if one exists. If it cannot find the program there or if no library is indicated, the system searches the System Program Library. All system programs are in this library; therefore, the system can locate them regardless of the library and volume specifications.

If you specify a volume and library, the volume must be mounted, and the library must exist on that volume.

Once the file, library, and volume names are established, you can run the object file by pressing ENTER or load the file for debug processing by pressing PF1. PF1 links you directly into the VS Debug facility, which is described in the VS Program Development Tools Reference.

3.3 CONTINUE PROCESSING

CONTINUE Processing is associated with PF1 on the Modified Command Processor menu (see Figure 3-2). This command resumes program execution from the point of interruption. Note that, because you cannot access the RUN Program or Procedure command from the Modified menu, it is impossible to run another program until you run the interrupted program to completion or cancel it.

3.4 SET USAGE CONSTANTS

SET Usage Constants is associated with PF2 on both Command Processor menus. This command allows you to:

- Designate default names used during interactive processing for commonly specified libraries and their associated volumes, and assign a default file protection class.
- Specify print mode options.
- Specify background job (procedure) submittal defaults.

The system uses the default values assigned with SET Usage Constants for the duration of the workstation session, until you respecify them, or until a procedure alters them.

3.4.1 File Defaults

The first screen displayed from SET Usage Constants is the Set File Defaults display. It allows you to specify default values for several libraries and volumes, and for a default file protection class. These library and volume names and the file protection class subsequently appear as defaults whenever input is required for these parameters. For example, the specified INLIB name (see the following list) appears as the default library whenever an input file is to be opened. When such defaults appear, you can change them by simply typing another name over it. If you do not specify a name for a particular library or volume, the system supplies no default when a file of that type is opened.

If your system is connected through Wang networking, you can queue a print file automatically to the Transmit queue (see Subsection 3.7.3, "The Transmit Queue") so that it can be printed on a remote system. Through remote printing, you can also automatically queue a print file to your physical system after you log on to a remote VS system. For more information, consult the VS Network User's Guide.

The Set File Defaults screen, illustrated in Figure 3-4, allows you to assign the following default parameters:

INLIB	The default input library; appears when an input file is opened.
INVOL	The default input volume; appears when an input file is opened.
OUTLIB	The default output library; appears when an output file must be specified.
OUTVOL	The default output volume; appears when an output file or library must be specified.
RUNLIB	The default runtime library; appears when RUN Program or Procedure is to execute a file.
RUNVOL	The default runtime volume; appears when RUN Program or Procedure is to execute a file.
SPOOLIB	The library in which system-created spool files are located. The system supplies a default name that includes your name from the user list, in the form #XXXPRT.
SPOOLVOL	The volume on which the spool library is located; spool files are created on this volume only if sufficient space exists on the designated disk.

WORKVOL The volume on which work files are located; work files are created on this volume only if sufficient space exists on the designated disk.

SPOOLSYS The name of the system (remote or local) to which you want to queue a print file.

FILECLAS The file protection class assigned to all output files; may be A - Z, \$, @, #, or ¢ and can be changed when a file is opened (see Section 1.10, "File Security," for further information).

*** Set Usage Constants ***

Default Location (Library and Volume) of Files, Assuming that these Values are not Parameterized via Procedure or Provided by the Program Itself:

Input Files:	INLIB	=	*****	INVOL	=	*****
Output Files:	OUTLIB	=	*****	OUTVOL	=	*****
User Programs:	RUNLIB	=	*****	RUNVOL	=	*****
Spooled Print Files:	SPOOLIB	=	*****	SPOOLVOL	=	*****
Work/Temporary Files:	WORKLIB	=	#CJMWORK	WORKVOL	=	*****
System for Remote Print Routing				SPOOLSYS	=	*****

Default File Protection Class for Output Files
(Use " ", "\$", "@", "#", or "A" through "Z"):

FILECLAS = \$

Alter these Displayed Default Constants in Place and Press (ENTER)

or Press (1) Set Print Mode Defaults
 (2) Set Procedure Submittal Defaults
 (HELP) Return to the Command Processor

Figure 3-4. Set File Defaults Screen Format

No restriction exists on the types of files that you can store in a library. You can specify the same library name for INLIB, OUTLIB, and RUNLIB, or specify different names for each. Similarly, you can place the libraries on the same volume or on different volumes.

The system creates work and spool libraries, but SET Usage Constants cannot change the name given for the work library. However, SET Usage Constants can designate the volume(s) on which these libraries are located. See Section 1.9, "Default Parameter Specification and the System Program Library," for more information. If space is not available for work or spool files on the specified volumes, the system automatically places these files on another volume. Also, if you specify a nonexistent volume for SPOOLVOL, the spooled files are lost and no message is displayed.

You cannot specify a name for your print library or for individual print files from the Command Processor. However, you can specify these names through VS Procedure language. Refer to the VS Procedure Language Reference for more information.

The bottom of the Set File Defaults screen contains a list of command options that allow you to set print mode defaults (PF1), set procedure (job) submittal defaults (PF2), or return to the Command Processor menu (HELP).

3.4.2 Print Mode Defaults

If you press PF1 from the Set File Defaults screen, the system displays the Set Print Mode Defaults screen. This screen allows you to specify default print mode parameters for spooled and on-line printing. These parameters determine how the operating system handles print files. Figure 3-5 illustrates the Set Print Mode Defaults screen, and the following list explains the parameters:

PRNTMODE	Determines the manner in which the system handles print files. The following four options are provided: H Hold Printer Files S Spool Printer Files K Keep as File, Do Not Queue O On-line Printing
PRTCLASS	The default print class (A - Z) to which print files are assigned. Each printer is assigned certain print classes and will print only files in those classes. Therefore, a file's print class determines which printers can print it. Refer to the <u>VS System Operators Reference</u> for further discussion of print classes for spooled print files.
FORM#	The default form number (0-254) which indicates the form type to use for printing spool and hold files from a workstation. Each installation defines its own FORM# and, on this screen, this number serves only as a comment to the system operator. The default is 000.

PRINTER The device number of the printer used for on-line printing. This parameter is meaningful only if the print mode is O (On-line). If the print mode is H (Hold), S (Spool), or K Keep), the PRINTER field can contain one of two values: the device address of a printer or TC device (which may be changed to a remote printer), or 000. If you specify a device address, the print file is spooled only to that printer. The file can be printed subsequently if the print class of the print request matches that of the printer.

If the device address is 000, the print file is spooled to the lowest device-numbered printer that is both available and matches the print class of the print request.

LINES The number of lines printed on each page. This parameter is for use only by user programs and certain system utilities. The values range from 0 to 255; the default is 55.

PRTFCLAS The file protection class for your print files. The options are:

- blank - unprotected
- # - private file (the default)
- @ - execute only
- \$ - read only
- A-Z - user-defined

The print file protection option should not be confused with the file protection class option for output files, which allows you to set a protection for source, object, and output files created by programs.

*** Set Usage Constants ***

Current Print Mode Defaults for Spooled and Online Printing:

S - Spool Printer Files	O - Online Printing	PRNTMODE = H
H - Hold Printer Files	K - Keep as File, Do Not Queue	
Default Spooled Print File Print Class ("A" thru "Z"):	PRTCLASS = A	
Form Number (000 thru 254):	FORM# = 000	
Default Online Printer Device Number:	PRINTER = 026	
Zero - Any eligible printer, Non-zero - Selected printer only		
Default Lines per Page (For Optional Program Use):	LINES = 055	
Default File Class for Print Files:	PRTFCLAS = #	

Alter these Displayed Default Constants in Place and Press (ENTER)

or Press (2) Set Procedure Submittal Defaults

(3) Set File Defaults

(HELP) Return to the Command Processor

Figure 3-5. Set Print Mode Defaults Screen

For further discussion of print spooling, manipulation of the print queue, and the Print Task, consult Section 1-8, "Printing Capabilities" in Chapter 1 of this manual, and the VS System Operator's Reference.

Print Modes

The four print modes have differing characteristics which makes each one useful under specific circumstances.

Spool. Use this mode to print your file automatically. The system stores the print output in a print file and places it in your print library. The system also creates an entry for that file on the print queue. When the file reaches the top of the queue and a printer becomes available, the system automatically prints it. Files move up the queue on a first-come, first-served basis, depending on their print file class. You can change this order from the print queue, but you can only move an entry downward (refer to Section 3.7.1 "Controlling the Print Queue"). Spool is the default mode which the system sets during Logon.

Hold. Use this mode to defer printing your file. The system stores the print output in a print file and places it in your print library. The system also creates an entry for the file on the print queue. However, the system does not print the file until you release it. You would generally use Hold to defer printing until you decide whether the output is of value. If you do not want the information from a print file, since the system is holding it on the queue, you can scratch it without printing it.

Keep. Use this mode to store print files without placing entries on the print queue. The system stores the print output in a print file and places it in your print library. However, the system does not create a print entry for the file. Therefore, you cannot release keep files for printing from the print queue screen. Keep is useful when you do not need printed output from a program; for example, during program testing. You can simply scratch keep files without interfering with the print queue.

On-line. The system writes on-line print files directly to the printer specified with this command, and prints them immediately if:

- The designated printer is available for on-line printing (i.e., is not allocated for spooled printing) and
- Another program is not using that printer.

The system never stores on-line print files on disk or enters them on the print queue. The use of on-line print mode is discouraged for the following reasons:

- It is inefficient and time-consuming because the files are sent to their printer(s) line by line as they are created.
- It is restrictive to the programmer since, because the files are printed directly, you cannot intervene or select specific material to print.
- Because on-line print files are not stored, permanent loss of some or all of the file can result if any interruption occurs in the movement of information to the printer.

The bottom of the Set Print Defaults screen contains a list of command options that allow you to set procedure submittal defaults (PF2), return to the Set File Defaults screen (PF3), or return to the Command Processor menu (HELP).

3.4.3 Procedure Submittal Defaults

If you press PF2 from the Set File Defaults screen, the system displays the Set Procedure Submittal Defaults screen, shown in Figure 3-6. This screen allows you to specify default values for the job submittal status, job scheduling class, and job execution time limit for background job processing. Then, the system displays the defaults that you specify on the SUBMIT Procedure command screen. (Section 3.14 describes the SUBMIT Procedure command.)

The Set Procedure Submittal Defaults screen provides the following parameters:

JOBQUEUE	The default job submittal status determines whether the system automatically executes the job or holds it in the queue until you release it. There are two options:				
	<table> <tr> <td data-bbox="508 1234 611 1268">R Run</td><td data-bbox="690 1234 1445 1268">The system runs the job automatically.</td></tr> <tr> <td data-bbox="508 1297 611 1331">H Hold</td><td data-bbox="690 1297 1445 1394">Assigns the designated job to the job queue; the operator may release it, change it, or cancel it.</td></tr> </table>	R Run	The system runs the job automatically.	H Hold	Assigns the designated job to the job queue; the operator may release it, change it, or cancel it.
R Run	The system runs the job automatically.				
H Hold	Assigns the designated job to the job queue; the operator may release it, change it, or cancel it.				
JOBCLASS	This parameter is the default job scheduling class (A - Z) to which jobs are assigned.				
JOBLIMIT	This parameter is the default job execution time limit, the most time the central processor may spend on a specific job. Specify the parameter in hours, minutes, and seconds. Zero or blank indicates no limit. The system uses this parameter in conjunction with the CPU LIMIT parameter of the SUBMIT Procedure command.				

*** Set Usage Constants ***

Current Defaults for Procedure Submittal via the Command Processor
"RUN" and "SUBMIT" Commands:

Default Submittal Status:

R - Run, Proc Eligible for Scheduling
H - Hold, Do Not Run Proc Until Released
by Submitter or Operator JOBQUEUE = R

Default Proc Scheduling Class ("A" thru "Z"): JOBCLASS = A

Default Proc Execution Time Limit:

Central Processor Time in Format HH:MM:SS
- No Value (or Zero) Indicates "No Limit" JOBLIMIT = 00 : 00 : 00

Alter These Displayed Default Constants in Place and Press (ENTER)

or Press (1) Set Print Mode Defaults
(3) Set File Defaults
(HELP) Return to the Command Processor

Figure 3-6. Set Procedure Submittal Defaults Screen

For additional information about background jobs, consult Sections 3.14, "SUBMIT PROCEDURE" and 1.11, "BACKGROUND PROCESSING."

The bottom of the Set Procedure Submittal Defaults screen contains a list of command options that allow you to set the print mode defaults (PF1), return to the Set File Defaults display (PF3), or return to the Command Processor menu (HELP).

3.5 SHOW PROGRAM COMPLETION REPORT

SHOW Program Completion Report is associated with PF3 on the Main Command Processor menu. This command is intended for the systems programmer/analyst and displays the following information about the program or procedure which was just completed:

- Name of the program
- Total elapsed time in hours, minutes, and seconds
- Total CPU time in hours, minutes, and seconds
- Total I/O operations performed for each workstation, printer (when the print mode is on-line), tape, and nonpaging disk
- Total page-ins and page-outs required by both the system and program

This command also displays the Segment 2 size for the workstation that issued this command. Segment 2 is the portion of main memory containing the static, or modifiable, portion of a program. The default Segment 2 space for each workstation is specified at system generation.

Figure 3-7 illustrates the SHOW Program Completion Report screen. The information on this screen is useful in assessing a program's total resource requirements and the efficiency with which that program is utilizing the virtual memory, given the current resource requirements of all other running programs, users, and I/O operations. The number of page-ins and page-outs refers to the number of times that virtual memory (a memory allocation technique) moves page segments of both system and user programs into and out of main memory.


```

*** Show Program Completion Report ***

Workstation 38 Ready          9:47 am          Wednesday July 6, 1983

          Program EDITOR   Processing Completed

Total Elapsed Time = 00:00:13 (HMS)   Program Processor Time = 00:00:00 (HMS)

      Total Workstation I/O          =      0 Operations
      Total Printer I/O              =      0 Operations
      Total Tape I/O                 =      0 Operations
      Total Non-Paging Disk I/O      =      4 Operations
      Total Page-Ins      =      25 (System)      =      0 (Program)
      Total Page-Outs    =      6 (System)      =      0 (Program)

      Segment 2 Address Space        =      256 K

          (HELP) Return to the Command Processor

```

Figure 3-7. SHOW Program Completion Report Screen

3.6 SHOW PROGRAM STATUS

The SHOW Program Status command is associated with PF3 on the Modified Command Processor menu. This command is intended for the systems programmer/analyst and displays the following information about the interrupted program or procedure:

- Name, library, and volume of the interrupted program
- Name of active subprogram (if applicable)
- Total elapsed time in hours, minutes, and seconds
- Total CPU time before interruption in hours, minutes, and seconds
- Total I/O operations performed for each workstation, printer (when print mode is on-line), tape, and nonpaging disk
- Total page-ins and page-outs used by both the system and the program before interruption

This command also displays the Segment 2 size and the remaining Segment 2 space for the workstation that issued the command (in bytes). Segment 2 is the portion of main memory containing the static, or modifiable, portion of a program. The default Segment 2 space for each workstation is specified at system generation.

Figure 3-8 illustrates the SHOW Program Status screen. The information on this screen is useful in assessing the current status of an interrupted program and the efficiency with which that program is utilizing virtual memory, given the current resource requirements of all other running programs, users, and I/O operations. The number of page-ins and page-outs refers to the number of times that virtual memory (a memory allocation technique) moves page segments of both system and user programs into and out of main memory.

```
*** Show Program Status ***

Workstation 38 Ready      9:48 am      Wednesday July 6, 1983

Program EDITOR in Library @SYSTEM@ on Volume SYSTEM
Was Waiting for Workstation Attention
Active Subprogram Was WELEDIT

Total Elapsed Time = 00:00:05 (HMS) Program Processor Time = 00:00:00 (HMS)

Total Workstation I/O      =      5 Operations
Total Printer I/O          =      0 Operations
Total Tape I/O             =      0 Operations
Total Non-Paging Disk I/O  =      0 Operations
Total Page-Ins      =      24 (System)      =      7 (Program)
Total Page-Outs     =      10 (System)      =      1 (Program)

Segment 2 Address Space    =      256 K
Remaining Stack Space      = 140352 Bytes

or Press (1) Show Files and Devices in Use,
          (2) Show Buffer Pooling Statistics
          (HELP) Return to the Command Processor
```

Figure 3-8. SHOW Program Status Screen

In addition to the subcommand HELP which returns to the Command Processor menu, two subcommands are available from this screen which provide additional information concerning the interrupted program:

- Show Files and Devices in Use (PF1) displays a table containing information about all the files and devices that the interrupted program is currently using. This table includes the name, library, volume, device(s), record number and record size, file type, and open status (i.e., extension, update) of each device for each open file.
- Show Buffer Pooling Statistics (PF2) displays a table containing the buffer pooling statistics for the interrupted program, if the program is using buffer pooling. This information includes the number of buffer pools currently in use and the following statistics for the first buffer pool: number of files using the pool, number of 2K buffers in the pool, buffer hit count, and buffer miss count. (Refer to the VS Operating System Services Reference for more information on buffer pooling.)

3.7 MANAGE QUEUES

The Manage QUEUES command is associated with PF4 on both Command Processor menus. This command displays and controls the print and procedure queues. When you press PF4, the system displays a two-entry screen that allows you to access the print queue (PF2) or the procedure queue (PF3). The combined entries on these two queues can total 1,920.

3.7.1 Controlling the Print Queue

To examine and manipulate the print queue, press PF2 from the Manage QUEUES screen. The system then displays the print queue screen, shown in Figure 3-9. This screen provides a list of the print queue entries, a statement of the total entries in the queue, and the following information for each file in the queue:

- Position of the entry in the print queue
- File, library, and volume names
- File originator
- Print class (A - Z)
- Print form number
- Number of copies to print (1 - 32767)
- Number of lines
- Post-printing disposition (blank, save, or requeue)
- Status (blank, hold, or printing)
- Printer device number

*** Print Queue Display ***
 9:49 am Wednesday July 6, 1983

11 Entries in Print Queue

File	Library	Volume	User	Class	Form	Copies	Lines	Disp	Status	Prt
1 JMTL0000	#JMTprt	NEWSYS	JMT	A	000	1	6		Printer	10
2 LOGO0024	#JSSprt	NEWSYS	CJM	A	000	1	36	SAVE	Hold	
3 EDIT0025	#JSSprt	NEWSYS	CJM	A	000	1	36		Hold	
4 EDIT0026	#JSSprt	NEWSYS	CJM	A	000	1	36		Hold	
5 EDIT0027	#JSSprt	NEWSYS	CJM	A	000	1	36		Hold	
6 EDIT0028	#JSSprt	NEWSYS	CJM	A	000	1	36		Hold	
7 EDIT0029	#JSSprt	NEWSYS	CJM	A	000	1	36		Hold	
8 EDIT0030	#JSSprt	NEWSYS	CJM	A	000	1	36		Hold	
9 EDIT0031	#JSSprt	NEWSYS	CJM	A	000	1	36		Hold	
10 EDIT0032	#JSSprt	NEWSYS	CJM	A	000	1	36		Hold	

Position Cursor to Indicate File(s) and Press PFkey to Perform Action:

(5) Next	(7) Hold/Release	(10) Change	(13) Change Disposition
(3) Last	(8) Scratch	(12) Remove	

Figure 3-9. Print Queue Screen

The disposition determines how the system will handle a print file after printing: scratch the file (blank), save the file but remove its entry from the queue (save), or save the file and retain its entry on the queue (requeue). The status indicates whether the file prints automatically when a printer is available (blank), remains on the queue until you release it for printing (hold), or is currently printing (printing).

The bottom of the print queue screen contains a menu of commands that you can use to manipulate the print queue entries identified by your User ID. You can change the entry's print class, form number, number of copies, and disposition. You can scratch the file, release it, hold it, or remove the entry from the queue and keep the file. You can also lower the position of an entry in the queue, but you cannot raise it. To perform any of these functions, position the cursor next to the file's entry and press one of the PF keys in the following list.

<u>PF Key</u>	<u>Option</u>	<u>Action</u>
2	First	Displays the first screen of print queue entries.
3	Last	Displays the last screen of print queue entries.
4	Previous	Displays the previous screen of print queue entries.
5	Next	Displays the next screen of print queue entries.
7	Hold/Release	Releases your file for printing, if it is on hold. In all other cases, PF7 changes the file's status to HOLD.
8	Scratch	Scratches the file and removes its entry from the print queue. You can scratch a file only if: ● You have access rights ● No unexpired retention period is specified ● No other queue entries exist
10	Change	Changes the file entry's position in the print queue; you can only lower the position within the file's print class. Also, changes the file's print class, print form number, and/or number of copies to print. You can change only your own print queue entries.
12	Remove	Removes the entry from the print queue, but does not scratch the file. (This effectively gives the file a Keep status.)
13	Change Disposition	Changes the print file entry's disposition. You can use this option only after the file is printed. The three possible choices follow: PF4 (Save) - Saves the print file but removes its entry from the print queue. PF5 (Requeue) - Saves the print file and places its entry at the end of the print queue.

PF8 (Scratch) - Scratches the print file and removes its entry from the print queue. The Disposition column is left blank. Scratch print files are actually scratched only if the file has no unexpired retention period, the user has scratch access rights, and no other print queue entries exist for that print file.

3.7.2 Controlling the Procedure Queue

To examine and modify the procedure queue, press PF3 from the Manage QUEUES screen. The system then displays the Procedure Queue screen shown in Figure 3-10. This screen provides a list of the background jobs in the queue, as well as the following information for each job:

- Position in the queue
- Originator (user)
- Proc-ID (the name of the job specified, when that job was submitted)
- Procedure's name, library, and volume
- Job class
- CPU time limit
- Abnormal termination dump specification
- Post-execution queue entry disposition
- Status

*** Procedure Queue Display ***
9:49 am Wednesday July 6, 1983

1 Procedures in Queue

	User	Proc-ID	Procedure	Library	Volume	Class	Limit	Dump	Disposition	Status
1	SFK	SFKTEST	PROC1	SFKPROC	NEWSYS	A W	0:00:30	Y	HOLD	HOLD

Position Cursor to Indicate Procedure and Press PFkey to Perform Action:

IMMEDIATELY:	(10) Change	AFTER EXECUTION:
(7) Hold/Release	(12) Remove	(13) Hold/Remove

Figure 3-10. Procedure Queue Screen

The system queues a background job by job class and by active/hold status. It executes the job according to the priority of its job class. Within a job class, jobs are executed on a first-in, first-out basis. (The operator can modify the job class priority list from the Operator's Console.)

The bottom of the procedure queue screen contains a menu of commands that you use to manipulate the procedure queue entries identified by your User ID. Options are available for both before and after execution of the job. To perform any of these functions, position the cursor next to the file's entry and press one of the following PF keys:

<u>PF Key</u>	<u>Option</u>	<u>Action</u>
2	First	Displays the first screen of procedure queue entries.
3	Last	Displays the last screen of procedure queue entries.
4	Previous	Displays the previous screen of procedure queue entries.
5	Next	Displays the next screen of procedure queue entries.

Before Execution:

7	Hold/Release	Releases your job for execution, if it is on hold. In all other cases, changes the status to HOLD.
10	Change	Changes the job's position in the queue; you can only lower the position. Also, changes the job class, CPU time limit, and/or abnormal termination DUMP parameter.
12	Remove	Removes the job from the queue without executing it. Note that you cannot remove an executing job; executing jobs must be cancelled by an operator from the Operator's Console.

After Execution:

13	Hold/Remove	Specifies the job's disposition as either Remove (blank) or Hold. Hold jobs are retained in the queue after executing and may be executed again; Remove jobs are deleted from the job queue after execution.
----	-------------	--

3.7.3 The Transmit Queue

To examine the transmit queue, press PF3 from the Manage DEVICES screen. The Transmit Queue screen contains information about files or documents being sent from your VS workstation to another location. The queue displays only those requests that are submitted by your VS system.

The transmit queue displays two types of information about transfer requests: local and remote. The local information identifies the file or document as it is recognized by the sending VS. The remote information identifies the file or document as it will be known to the receiving system. For detailed information about the Transmit queue, consult the VS Network User's Guide.

3.7.4 The Retrieve Queue

To examine the retrieve queue, press PF4 from the Manage QUEUES screen to display the Retrieve Queue screen. The retrieve queue displays information about all files or documents being retrieved by your VS system from a remote location. The queue displays only those retrieval requests that have been issued by your VS. The screen shows how the file or document will be identified when received by your VS. For detailed information about the retrieve queue, consult the VS Network User's Guide.

3.8 MANAGE FILES/LIBRARIES

The Manage FILES/LIBRARIES command is associated with PF5 on both Command Processor menus. This command allows you to inspect and modify the contents of on-line disk volumes. Manage FILES/LIBRARIES provides the following information:

- The names of all currently mounted volumes
- The names of all libraries on a mounted volume
- The number of files in all libraries on a volume
- The names of all files in a library
- The attributes of any file
- The 20 largest free extents on any volume

You can access information about libraries and files through a system that presents library, file, and file attribute information on successive screens. To access a more detailed level of information, you merely position the cursor and press ENTER. For example, from the VOLUMES screen, if you wish to access information about the libraries on volume ZZZZZ, position the cursor next to the volume name, ZZZZZ, and press ENTER. The system displays the LIBRARIES screen for volume ZZZZZ.

3.8.1 Volume Information

The first screen that Manage FILES/LIBRARIES provides is the Volumes screen, shown in Figure 3-11. This screen provides a list of all currently mounted volumes. To examine information about the libraries on a particular volume, position the cursor to the volume name and press ENTER. You can also enter the volume name next to VOLUME at the top of the screen and press ENTER. In either case, the system displays the Libraries screen for that volume.

To access information about a particular file or library from this screen, you must type in values for VOLUME and LIBRARY (for a library) or VOLUME, LIBRARY, and FILE (for a file). The system then displays the appropriate screen.

If you used the SET Usage Constants command to provide default names for INVOL and INLIB, these values appear for VOLUME and LIBRARY, respectively.

This screen also provides two PF key options. You can examine the first 20 free extents on a volume by positioning the cursor (via TAB) to the desired volume in the list and pressing PF12 (see Subsection 3.8.5, "Free Extents on a Volume"). You can also print the command screen by pressing PF15 (see Subsection 3.8.6, "Print Screen").

```
***  Manage Files/Libraries  ***

Use Direct Entry To Manage a Particular File or Library:

      VOLUME = NEWSYS  LIBRARY = CJMOBJ**  FILENAME = *****

Or Select a Volume from the List of Currently Mounted Volumes
  by Positioning the Cursor at the associated Tabstop:

* NEWSYS
* TC1VOL
* VOL555
* ZENITH

Then Select:          (ENTER) To Display Libraries on the Volume
                      (12) Free Extents on the Volume
                      (15) Print Screen
                      (HELP) Return to Command Menu
```

Figure 3-11. Volumes Screen

3.8.2 Library Information

There are two ways to access library information from the Volumes screen, as explained above. After pressing ENTER, the first Libraries screen, shown in Figure 3-12, appears. This screen provides the following information:

- The number of libraries and files located on the designated volume
- An alphabetical list of all libraries resident on that volume
- The number of files located in each library

If you enter the name of a library, as well as that of a volume in the Volumes screen, the first library displayed on the list is the library you specified. Similarly, you can enter a partial library name, and the first name displayed is the library that alphabetically follows that partial name.

*** Libraries ***

Volume NEWSYS Contains 2496 Files in 213 Libraries.

<u>Library</u> <u># Files</u>	<u>Library</u> <u># Files</u>	<u>Library</u> <u># Files</u>
* CJMOBJ 9	* DIAG064A 3	* DOCMNTE 1
* CMNASMBL 1	* DJECOPY 1	* DOCMNTEE 34
* CMNPROCS 3	* DJELIB 1	* DOCMNTGG 1
* COBEXAMP 21	* DJEOBJ 2	* DOCMNTH 2
* COURSE 15	* DJESAVE 1	* DOCMNTI 5
* DATA 4	* DOCMNT0 12	* DOCMNTJ 2
* DATAOUT 1	* DOCMNTA 40	* DOCMNTJJ 3
* DBLLIB 1	* DOCMNTAA 5	* DOCMNTK 2
* DBLOBJ 1	* DOCMNTB 25	* DOCMNTL 3
* DEMO 26	* DOCMNTC 1	* DOCMNTM 34
* DEMOOBJ 17	* DOCMNTCC 4	* DOCMNTMM 2
* DEMOSUBR 17	* DOCMNTD 15	* DOCMNTN 1

Position Cursor and Press (ENTER) to Display Filenames or Select:

(1) Return to Volume Display	(7) Rename	
(2) First (4) Previous	(8) Scratch	
(3) Last (5) Next	(9) Protect	(15) Print Screen

Figure 3-12. The Libraries Screen

The Libraries screen provides several PF key options. They display the pages of the library list and perform certain functions on the libraries in that list. To perform an operation on a specific library, position the cursor in the pseudoblink next to the desired library name, and press the appropriate PF key. The following list contains all the commands available from the Libraries screen:

<u>PF Key</u>	<u>Option</u>	<u>Action</u>
ENTER	Display Filenames	Displays the names of the files contained in the specified library.
1	Return to Volume Display	Returns to the Volumes screen.
2	First	Displays the first screen of libraries on the volume.
3	Last	Displays the last screen of libraries on the volume.
4	Previous	Displays the previous screen of libraries on the volume.
5	Next	Displays the next screen of libraries on the volume.
7	Rename	Renames the designated library.
8	Scratch	Scratches the designated library.
9	Protect	Allows you to modify the Protection Class (PF2), Owner of Record (PF3), and Expiration Date (PF4) of the designated library.
15	Print Screen	Copies the current screen to a printed file.

3.8.3 File Information

There are two ways to access file information:

- On the Libraries screen, position the cursor next to the library whose file information you wish to examine and press ENTER.
- On the Volumes screen, specify a name for FILE as well as for VOLUME and LIBRARY.

Both methods access the Filenames screen, shown in Figure 3-13. The Filenames screen displays the number of files assigned to the designated library and an alphabetical listing of all files in that library.

If you specified a file name in the Volumes screen to reach this screen, the file you specified is the first file displayed. Also, if you enter a partial file name, the first name displayed is the file that alphabetically follows that partial name.

*** Filenames ***		
Library JSSOBJ on Volume NEWSYS Contains 9 Files.		
Filename	Filename	Filename
_____	_____	_____
* JSSCOBSR		
* JSSCRTN		
* JSSCRTN2		
* EXAMPLE1		
* FILECRE		
* EXAMPLE		
* ITEMPAGE		
* SAMPLE		
* JSSBASSR		
<u>Position Cursor and Press (ENTER) to Display File Attributes or Select:</u>		
(1) Return to Library Display	(7) Rename	
	(8) Scratch	
	(9) Protect	
	(10) Print	(15) Print Screen

Figure 3-13. Filenames Screen

The Filenames screen provides several PF key options. They display the pages of the file name list and perform certain functions on the files in that list. To perform an operation on a specific file, position the cursor in the pseudobank next to the desired file's name, and press the appropriate PF key. The following list contains all the commands available from the Filenames screen:

<u>PF Key</u>	<u>Option</u>	<u>Action</u>
ENTER	Display File Attributes	Displays the attributes of the specified file.
1	Return to Library Display	Returns to the Libraries screen.
2	First	Displays the first screen of file names in the library.
3	Last	Displays the last screen of file names in the library.
4	Previous	Displays the previous screen of file names in the library.
5	Next	Displays the next screen of file names in the library.
7	Rename	Renames the designated file.
8	Scratch	Scratches the designated file.
9	Protect	Permits you to modify the Protection Class (PF2), Owner of Record (PF3), and Expiration Date (PF4) of the designated file.
10	Print	Prints the designated file if it is a print file; displays a screen through which you can specify the print mode, print class, scratch option, number of copies, and form number to use when printing.
15	Print Screen	Copies the current screen to a print file.

3.8.4 File Attribute Information

To access file attributes information from the Filenames screen, position the cursor next to the name of the desired file and press ENTER. The system displays the File Attributes screen, shown in Figure 3-14. This screen provides the following information about the designated file:

- Name, library, and volume
- Organization - indexed or consecutive
- Record length - variable or fixed
- Record compression option
- Date created
- Date last modified
- Expiration date
- Protection class
- Special access rights if a program file has any
- Characteristics
 - Number of records
 - Record length (bytes)
 - Number of extents allocated
 - Number of blocks used
 - Number of blocks allocated

```

*** File Attributes ***

Filename is PRTDFU1A
Library  is #JSSWORK
Volume   is NEWSYS

Organization is WORD PROCESSING
Record Length is FIXED
Records      are NOT COMPRESSED

File Was Created   on    7/06/83
Was Last Modified  7/06/83
Expiration         is    7/06/83
Protect Class     is    BLANK
Consists of                52 Records, of Length 256, in 3 Extents
                          7 Blocks                (7 Blocks Allocated)

Press PFkey to Perform Action:

(1) Return to Filename Display      (10) Print      (15) Print Screen

```

Figure 3-14. Sample File Attributes Screen

There are three options available to the user from the File Attributes screen:

<u>PF Key</u>	<u>Option</u>	<u>Action</u>
1	Return to Filename Display	Returns to the Filenames screen.
10	Print	Prints the designated file if it is a print file; displays a screen through which you can specify the print mode, print class, scratch option, number of copies, and form number to use when printing.
15	Print Screen	Copies the currently displayed screen to a print file.

DMS/TX Information

If your system is using the DMS/TX software, the File Attributes screen displays two DMS/TX attributes messages. "Recovery blocks are allocated" indicates that the file has recovery blocks and is available for database attachment. "Recovery blocks are in use" indicates that recovery blocks have been allocated and the file is currently attached to a database. If a file does not have recovery blocks, neither message appears on this screen.

The File Attributes screen displays both the number of blocks allocated and the number of blocks in use. The number of allocated blocks includes the two file recovery blocks if recovery blocks have been allocated. The number of blocks in use does not include the file recovery blocks.

The File Attributes screen displays the number of records and the number of blocks in use when the file was last closed. Thus, the numbers may not be accurate for files that require recovery; DMS/TX establishes the proper values for these numbers as part of the recovery process. For the same reason, the numbers of records and blocks in use for DMS/TX Before Image Journal (BIJ) files are usually shown as zero on the File Attributes screen, regardless of the actual number of records or blocks in use. For detailed information about the DMS/TX software, consult the VS DMX/TX Reference.

3.8.5 Free Extents on a Volume

You access the Free Extents on The Volume subcommand from the Volumes screen by positioning the cursor in the pseudoblock next to the name of the desired volume and pressing PF12. The Free Extents screen, shown in Figure 3-15, displays the total number of free extents and the total number of blocks available in the free extents, as well as a table of the 20 largest free extents on the volume. This table shows the total size of each extent and the disk addresses of the first and last blocks of each free extent. From the Free Extents screen, you can either return to the Volumes display (PF1) or print the screen (PF15).

*** Free Extents ***						
Volume NEWSYS Contains 27 Free Extents, Totalling 11383 Blocks. The Largest 20 Free Extents are Listed Below.						
Size	First/Last Block		Size	First/Last Block		
5634	31358	36991	38	16910	16947	
2304	18678	20981	13	1505	1517	
1742	29361	31102	13	5657	5669	
931	28323	29253	10	5398	5407	
223	6004	6226	9	5613	5621	
150	7656	7805	8	5560	5567	
128	14198	14325	8	5735	5742	
62	18411	18472	7	4129	4135	
39	7533	7571	6	18537	18542	
38	5965	6002	6	21397	21402	
Press Pfkey to Perform Action:						
(1) Return to Volume Display				(15) Print Screen		

Figure 3-15. Free Extents Screen

3.8.6 Print Screen

If you press PF15 from any of the previously mentioned command screens, you access the Print Screen command. This command creates a print file from the current screen. (It is available for all screens accessible from the Command Processor.)

3.9 MANAGE DEVICES

The Manage DEVICES command allows you to view the current information about the status of all the peripheral devices on the system. It also permits you to mount and dismount disks and tapes and to perform other device management functions. Additional information about device management is available in the VS System Operator's Reference.

When you press PF6 from the Main or Modified Command Processor menu, the Display Devices screen, shown in Figure 3-16, appears. From this screen, you press the appropriate PF key to display information about a specific device type. The PF key for a particular device type does not appear unless that type of device is actually present on the system.

```
*** Display Devices ***
9:50 am      Wednesday      July 6, 1983

(2) PRINTERS

(3) DISKS

(4) TAPES

(5) WORKSTATIONS

Press (HELP) at Any Time to Return to the Command Processor
```

Figure 3-16. The Display Devices Screen

You can display the Display Devices screen from any device screen by pressing PF1. To move from one device screen to another (for example, from the DISKS screen to the WORKSTATIONS screen), you must return to the Display Devices screen and then proceed to the next device screen.

3.9.1 Managing Printers

To reach the Display Printers screen, press PF2 from the Display Devices screen. The Display Printers screen provides information about all local printers configured for the system and all remote printers which are currently connected. The information is listed in the order of the unit number (device address). The following information is provided for all printers:

- Unit number (device address)
- Device model number
- Currently mounted form number
- Printer type -- matrix, band, chain, image, daisy, typesetter
- Status -- detached, idle, released, waiting, printing

If a printer is released, its owner's User ID and/or job name appear. If the printer is printing, the submitter's file name, library, volume, and User ID are displayed. If there is a problem with the printer (for example, forms not mounted), the Status field blinks.

Figure 3-17 illustrates the Display Printers screen. Note that the bottom of the screen lists a Display Scheduling command. This command displays a list of scheduling information; this information is described in the VS System Operator's Reference. To access the scheduling information for a specific printer, position the cursor next to that printer's entry and press PF7.

*** Display Printers ***				
9:51 am Wednesday July 6, 1983				
Unit	Device	Form	Type	Status
3	5571	000	Chain	Waiting for Print File
40	6581-W		Daisy	Waiting for Print File
41	6581-W		Daisy	Waiting for Print File
Position Cursor To Indicate Device and Select:				
(1) Menu				
(7) Display Scheduling				

Figure 3-17. Display Printers Screen

3.9.2 Managing Disks

To reach the Control Disks screen, press PF3 from the Display Devices screen. The Control Disks screen provides information about all the disk units configured for the system. The information is listed in the order of the unit number (device address). The following information is provided for all disk devices:

- Unit number
- Device model number
- Capacity in megabytes or kilobytes
- Platter type (removable, fixed, or diskette)

If a volume is mounted on the unit, the following additional information appears:

- Volume name
- Restrictions (restricted removal, protected use, or exclusive use)
- Number of open files
- Any status other than Ready

Figure 3-18 illustrates the Control Disks screen. Note that the bottom of the screen contains a list of the commands available to control disks and the PF keys associated with them. These commands are described below.

*** Control Disks ***						
9:52 am		Wednesday		July 6, 1983		
Unit	Device	Capacity	Type	Volume	Restrictions	Open Files Status
16	2265V-1	75 Mb	Rem	A40259		0
17	2265V-1	75 Mb	Rem	VOL555		63
18	2265V-2	288 Mb	Rem	SYSTEM		18
19	2265V-2	288 Mb	Rem	WORK		5
23	2270V-0	315 Kb	Dsket			
Position Cursor To Indicate Device and Select:						
(1) Menu			(6) Mount		(10) Change Restrictions	
			(7) Dismount		(11) Owner Information	

Figure 3-18. Control Disks Screen

Mounting a Volume

To logically mount a volume on a disk unit, position the cursor at the line describing the unit, and press PF6. Fixed/removable disk combinations are described on two lines; move the cursor to either line of the description.

The Mount Disk screen, shown in Figure 3-19, is displayed. Supply the following parameters:

VOLUME Volume name; if you specify a name that does not correspond to the name on the volume's label, the system logically mounts the tape with the name on the label and sends you an appropriate message.

LABEL One of the following label types:

NL Nonlabeled
SL Standard disk label

If a disk volume was not initialized with a standard disk label (SL), the disk volume is regarded as nonlabeled and you should specify it as NL. Also, note that all uninitialized disk volumes must be mounted with the DISKINIT utility (described in the VS System Utilities Reference).

MODE Choose one of the following modes:

SH	Shared Use	Any user can read from, write to, or dismount a shared volume.
RR	Restricted Removal	Only a user at the workstation from which the volume was mounted may dismount it; all other users may read from or write to the volume.
PR	Protected Use	All users may read from this volume, but only the user who mounted it may write to it or dismount it.
EX	Exclusive Use	Only the user at the workstation from which the volume was mounted may access it; no other users may perform any functions on it.

Allow Work Files?	Indicate whether the volume can be used for work libraries. Enter YES or NO. The default is NO.
Allow Spool Files?	Indicate whether the volume can be used for spool libraries. Enter YES or NO. The default is NO.
Allow Paging Files?	Indicates whether the volume can be used for paging files. Enter YES or NO. The default is NO.
Allow Special Program Rights?	Indicates whether special program rights are allowed. Enter YES or NO. The default is NO.

```

*** Mount Disk ***
9:54 am           Wednesday    July 6, 1983

Device 23
Removable Platter

VOLUME = *****

LABEL  = SL      (SL = Standard,  NL = No Label)

MODE   = SH      (SH = Shared,    RR = Restricted Removal)
                (PR = Protected, EX = Exclusive)

Allow Work Files?           WORK  = NO*

Allow Spool Files?          SPOOL = NO*

Allow Paging Files?         PAGING = NO*

Allow Special Program Rights? SECURE = NO*

Press (ENTER) to Mount, or Press (1) to Return to Display

```

Figure 3-19. Mount Disk Screen

Press ENTER to initiate a logical mount. The system prompts you to physically mount the disk. Press PF1 to cancel the mount and return to the Control Disks screen.

If a volume is already mounted in the specified disk unit, the system instructs you to remove that volume prior to mounting the new one unless one of the following conditions exists:

1. The volume's MODE is EX, PR, or RR. A volume mounted with one of these MODES can only be dismounted from the workstation at which it was mounted.
2. The volume is "in use." A volume is in use if one or more of its files are currently open. A volume cannot be dismounted until all its files are closed.

Dismounting a Volume

To logically dismount a volume, position the cursor at the line that describes the volume, and press PF7. The volume name blinks so you can verify that this is the volume you wish to dismount. Then press ENTER to initiate a logical dismount. The system prompts you to dismount the volume physically. Press PF1 to cancel the dismount and return the screen to its normal state.

You can dismount a volume only if you have the access rights to do so. Also, you cannot dismount a volume if one or more of its files are in use.

A dismount is not allowed for Models 2260V or 2280V Fixed/Removable Disk Units, because neither drive will function without a removable cartridge. You can dismount a cartridge only by mounting another cartridge via Mount.

Change Restrictions

This command modifies the mount restrictions. To change these restrictions for a specific volume, move the cursor to the line that describes that volume, and press PF10. The system highlights the Restrictions column and lets you type over the entry. Enter one of the following restrictions:

- Shared
- Removal (restricted removal)
- Protected
- Exclusive

These choices are listed at the bottom of the screen. The command accepts any unique, leading substring. A blank restriction is equivalent to Shared.

Press ENTER to effect the change or press PF1 to cancel the command and return the screen to its original state.

Owner Information

To access information about the volume owners, press PF11. A volume owner is the user who mounted the volume.

Owner Information displays the following data in the right-hand columns of the display screen, as shown in Figure 3-20:

- Owner's User ID and/or the name of the submitted job which has mounted the volume; this is supplied unless the volume is mounted for initialization or is a No Label (NL) volume.
- Volume's eligibility for work file and/or spool file allocations.

The Owner Information screen also makes two additional commands available. A description of these commands, Change and Status Information, follows.

*** Control Disks ***							
10:00 am		Wednesday		July 6, 1983			
Unit	Device	Capacity	Type	Volume	User	Proc-ID	Spool Work
16	2265V-1	75 Mb	Rem	A40259			NO NO
17	2265V-1	75 Mb	Rem	VOL444	SYSTEM		YES YES
18	2265V-2	288 Mb	Rem	SYSTEM			NO NO
19	2265V-2	288 Mb	Rem	WORK			NO NO
23	2270V-0	315 Kb	Dsket				
<u>Position Cursor To Indicate Device and Select:</u>							
(1) Menu		(6) Mount		(10) Change			
		(7) Dismount		(11) Status Information			

Figure 3-20. Owner Information Screen (Disks)

Change

This command modifies work and spool file eligibility. To change these restrictions for a specific volume, position the cursor next to that volume's entry and press PF10. The system highlights the Work and Spool columns and allows you to change the entries. Enter YES or NO in the column you want to change. Then press ENTER to effect the change or press PF1 to cancel the command and return the screen to its original state.

Status Information

Owner data replaces the mount restrictions, number of open files, and status information that appears on the Control Disks screen. To return to the Control Disks screen and that information, press PF11 from the Owner Information screen.

3.9.3 Managing Tapes

To display the Control Tapes screen, press PF4 from the Display Devices screen. The Control Tapes screen provides information about all the tape units configured for the system. The information is listed in the order of the unit number (device address). The following information is provided for all tape devices:

- Unit number (device address)
- Device model number
- Device type -- 9-track or 7-track dual (DD) or single density

If a volume is mounted on the unit, this additional information appears:

- Volume name
- Tape label -- AL = ANSI Label, NL = No Label, IL = IBM Label
- Tape density
- Any status other than Ready

Figure 3-21 illustrates the Control Tapes screen. The bottom of the screen contains a list of the commands available to control tapes and the PF keys associated with them. These commands are described below.

*** Control Tapes ***
10:05 am Wednesday July 6, 1983

Unit	Device	Type	Volume	Label	Density	Status
28	2209V-2	9-Track-DD				
29	2209V-3	7-Track				

Position Cursor To Indicate Device and Select:

(1) Menu

(6) Mount
(7) Dismount

(11) Owner Information

Figure 3-21. Control Tapes Screen

Mount

To logically mount a volume on a tape unit, position the cursor at the line describing the unit, and press PF6. The Mount Tape screen, shown in Figure 3-22, is displayed. Supply the following parameters:

VOLUME The volume name; if you specify a name that does not correspond to the name on the volume's label, the system logically mounts the tape using the name on the label and sends you an appropriate message.

LABEL One of the following label types:

AL ANSI tape label
NL Nonlabeled
IL IBM tape label

MODE Choose one of the following modes:

SH Shared Use Any user can read from, write to, or
 dismount a shared volume.

EX Exclusive Use Only the user at the workstation
 from which the volume was mounted
 may access it; no other users may
 perform any functions on it.

The system automatically changes a tape volume mounted for shared use to exclusive use when the first user attempts to open a file on the tape.

*** Mount Tape ***		
10:10 am	Wednesday	July 6, 1983
Device 28		
VOLUME = *****		
LABEL	= AL	(AL = ANSI, NL = No Label, IL = IBM)
MODE	= EX	(EX = Exclusive, SH = Shared)
<u>Press (ENTER) to Mount, or Press (1) to Return to Display</u>		

Figure 3-22. Mount Tape Screen

Press ENTER to initiate a logical mount; the system will prompt you to physically mount the tape. To cancel the mount and return to the TAPES screen, press PF1.

If a volume is already mounted in the specified disk unit, the system instructs you to remove that volume prior to mounting the new one unless one of the following conditions exists:

1. The volume's MODE is EX; a volume mounted with this MODE may only be dismounted from the workstation at which it was mounted.
2. The volume is "in use." A volume is in use if one or more of its files are currently open. A volume cannot be dismounted until all its files are closed.

Dismount

To logically dismount a volume, move the cursor to the line that describes the volume and press PF7. The volume name blinks. Then, press ENTER to initiate a dismount; the system prompts you to physically dismount the tape. Press PF1 to cancel the dismount and return the screen to its normal state.

You can dismount a volume only if you have the access rights to do so. Also, you cannot dismount a volume if one or more of its files are in use.

Owner Information

To access information about the volume owners, press PF11. The Owner Information screen presents the following information in the screen's right-hand columns, as illustrated in Figure 3-23.

- Restrictions -- Exclusive or Shared
- Owner's User ID -- if applicable
- Owner's job name -- if applicable

The Owner Information screen also makes two additional commands available. These commands, Change Restrictions and Status Information, are described below.

*** Control Tapes ***						
10:11 am		Wednesday		July 6, 1983		
Unit	Device	Type	Volume	Restrictions	User	Proc-ID
28	2209V-2	9-Track-DD				
29	2209V-3	7-Track				
<u>Position Cursor To Indicate Device and Select:</u>						
(1) Menu		(6) Mount		(10) Change Restrictions		
		(7) Dismount		(11) Status Information		

Figure 3-23. Owner Information Screen (Tapes)

Change Restrictions

The Change Restrictions command modifies the mount restrictions. To change these restrictions for a specific volume, position the cursor at the left of the entry for that volume, and press PF16. The system highlights the Restrictions column and lets you type over the entry. Enter one of the following restrictions:

- Shared
- Exclusive

The command accepts any unique, leading substring, and the default is Shared.

Press ENTER to effect the change, or press PF1 to cancel the command and return the screen to its original state.

Status Information

Owner data replaces the label, density, and status information presented on the Control Tapes screen. To return to the Control Tapes screen and that information, press PF11 from the Owner Information screen.

3.9.4 Managing Workstations

To access the Display Workstations screen, press PF5 from the Display Devices screen. The Display Workstations screen provides information about all local workstations that are configured for the system and all remote workstations that are currently connected. The unit number and device model number appear for all workstations; additional information appears in the following specific cases:

Status information	appears for any unit that is not Ready.
User ID	appears if the user is logged on.
User name	appears if the user is logged on.
Operator	appears in the Status column if the workstation is an Operator's Console.

Figure 3-24 illustrates a Display Workstations screen. Note that the bottom of the screen contains a list of PF keys that move the list backward or forward if it fills more than one screen.

*** Display Workstations ***
 11:00 am Wednesday July 6, 1983

Unit	Device	User	Name	Status
0	2246C	ABC	tech writing	
1	2246C	TM	Tom	
2	2246C	SHR	SHARER	
4	2246C	SAL	Sally	
5	2246C	RWL	Rick	
6	2246C			Disconnected
7	2246C			
8	2246C			Disconnected
9	2246C	SKH	Susan	
10	2246C	LPK	Leonard	

Position Cursor To Indicate Device and Select:

(1) Menu
 (3) Last (5) Next

Figure 3-24. Display Workstations Screen

3.10 MANAGE COMMUNICATIONS

The Manage COMMUNICATIONS command is associated with PF8 on both Command Processor menus. This command enables you to attach or log on to VS systems that are physically separate (remote) from your workstation's computer. VS remote logon allows you interactive access to shared peripheral devices and data processing facilities at remote sites.

When you press PF8, the Display Communications screen is displayed, shown in Figure 3-25.

```
*** Display Communications ***
2:00 pm      Wednesday      July 6, 1983
```

- (3) Communications ACCESS
- (4) Communications LINKS
- (5) Communications SYSTEMS
- (6) Communications DEVICES

Press (HELP) at Any Time to Return to the Main Menu

Figure 3-25. Display Communications Screen

The Display Communications screen provides the following four PF key options:

<u>PF Key</u>	<u>Option</u>	<u>Action</u>
3	ACCESS	Displays all communications between your system and all other systems.
4	LINKS	Displays communications through a specific link or Data Link Processor (DLP).
5	DEVICES	Displays specific DLPs. The DLP device type, unit number, and status if active is shown.
6	SYSTEMS	Displays communications services between a VS and a specific remote system.

For further information, consult the VS Network Configuration and Operations Guide and the VS Network User's Guide.

3.11 ENTER WORD PROCESSING

Enter WORD PROCESSING is associated with PF9 on the Main Command Processor menu if you have a combined workstation and the Word Processing software package. This command runs word processing on the VS directly from the Main Command Processor menu.

When you press PF9, the system displays the Word Processing menu and makes all word processing functions available. For information about VS Word Processing, consult the VS/WP Introducing Word Processing on the VS and the VS/IIS Supervisor's Procedures.

3.12 ENTER DEBUG PROCESSING

Enter DEBUG PROCESSING is associated with PF10 on the Modified Command Processing menu. When a program is interrupted, this command initiates debug processing, which allows you to inspect the program and its associated data and status information and to perform a variety of debugging operations. The facilities provided by this command are described in the VS Program Development Tools Reference.

3.13 ENTER OPERATOR MODE

The Enter OPERATOR Mode command is associated with PF11 on both Command Processor menus if you have a dual mode workstation. This command displays the Operator's Console menu, which makes all operator functions available. This menu offers the following options, which are discussed in the VS System Operator's Reference:

- Display and control of print and procedure queue entries
- Control of devices
- Control of interactive and background processing tasks
- Control of device and system status
- Printing of the I/O error log

3.14 SUBMIT PROCEDURE

SUBMIT Procedure is associated with PF12 on both Command Processor menus. This command submits a job for background processing on the VS. Section 3.14.1 discusses background jobs and their controlling procedures. Section 3.14.2 describes submitting a job.

3.14.1 Background Procedures

Background jobs are run from procedures written in the VS Procedure language (consult the VS Procedure Language Reference). The procedures execute specified programs and commands, and run on a noninteractive, time-independent basis. All programs that are run by a background procedure must be fully parameterized, including all user-program GETPARMs and COBOL ACCEPT or DISPLAY statements. You parameterize a procedure by using multiple ENTER statements or default values (such as with a SET statement). You must use a SET statement within the background procedure to specify any defaults used within the background job: for example, to specify Print mode defaults.

In a background procedure, all statements that attempt any workstation I/O cause immediate abnormal termination of that background job. Note that DISPLAY statements normally force screen transactions and, therefore, should not be used in background procedures.

Three specific background processing conditions result in prompts to the operator. When any of the following conditions occur, the system displays a message at the Operator's Console; the user workstation from which the background job was submitted is not disturbed.

1. When the running procedure issues a volume mount or dismount via the MOUNT and DISMOUNT procedure statements or SVCs, the system issues a message at the Operator's Console prompting appropriate operator intervention.
2. When a volume specified in the background procedure is not mounted, the operator must either supply a unit number and mode for a subsequent mount or cancel the job.
3. When the background program or procedure encounters a possession conflict (such as a file already in use), the operator can attempt the operation again or cancel the job.

3.14.2 Submitting a Procedure

When you press PF12 (SUBMIT Procedure), the system displays the Submit Procedure screen shown in Figure 3-26.

*** Submit Procedure ***

Identify the Procedure to be Run and Press (ENTER):

FILE = ***** in LIBRARY = JSSMISC* on VOLUME = NEWSYS

Scheduling Options: PROCEDURE ID = JSS00000
CLASS = A ("A" thru "Z")
STATUS = R (R-Run / H-Hold)

Execution Options: On Abnormal Termination,
DUMP = P (Y-Yes / N-No / P-Program Default)
CPU LIMIT = ** : ** : ** Optional (HH:MM:SS)
If CPU Limit Exceeded,
ACTION = * (C-Cancel / W-Warn / P-Pause)

Or Press (HELP) to Return to the Command Processor

Figure 3-26. SUBMIT Procedure Screen

You specify the procedure that you want to run as a background job by entering its file, library and volume names. Next, you can specify that job's scheduling options, job name, job class, and job status, as well as the execution options for a complete dump, a CPU time limit, and the action for the system to take if the CPU time limit is exceeded. After you specify these options and press ENTER, the system validates a procedure queue entry (e.g., regarding file access) and enters it on the procedure queue. Then, the procedure either runs as soon as possible (if its Status is R) or remains on the queue until the operator or procedure owner of record releases it for execution (if its Status is H). The procedure submittal options are as follows:

FILE, LIBRARY, VOLUME	The file, library, and volume names that identify the procedure file you are submitting.									
JOB NAME	An optional name which can uniquely identify the submitted job. The system prints this name on the header page of printouts created by background jobs, as well as on indicative dump pages. This name is also referred to as PROC-ID for Operator's Console functions.									
CLASS	The job class (A - Z) assigned to the submitted procedure. The system processes background jobs according to the job class priority hierarchy specified from the Operator's Console (see the <u>VS System Operator's Reference</u>); within a job class, the system processes the jobs on a first-in, first-out basis.									
STATUS	Determines when the system executes the job: <table border="0" style="margin-left: 40px;"> <tr> <td style="vertical-align: top; padding-right: 20px;">R</td> <td style="vertical-align: top; padding-right: 20px;">RUN</td> <td>The system executes the job as soon as possible.</td> </tr> <tr> <td style="vertical-align: top; padding-right: 20px;">H</td> <td style="vertical-align: top; padding-right: 20px;">HOLD</td> <td>The system holds the job on the job queue until the operator or owner of record releases it for execution.</td> </tr> </table>	R	RUN	The system executes the job as soon as possible.	H	HOLD	The system holds the job on the job queue until the operator or owner of record releases it for execution.			
R	RUN	The system executes the job as soon as possible.								
H	HOLD	The system holds the job on the job queue until the operator or owner of record releases it for execution.								
DUMP	Specifies whether the system will perform a complete dump upon abnormal job termination: <table border="0" style="margin-left: 40px;"> <tr> <td style="vertical-align: top; padding-right: 20px;">Y</td> <td style="vertical-align: top; padding-right: 20px;">YES</td> <td>Prints a full program dump following abnormal job termination.</td> </tr> <tr> <td style="vertical-align: top; padding-right: 20px;">N</td> <td style="vertical-align: top; padding-right: 20px;">NO</td> <td>Does not print a full dump following abnormal job termination.</td> </tr> <tr> <td style="vertical-align: top; padding-right: 20px;">P</td> <td style="vertical-align: top; padding-right: 20px;">DEFAULT PROGRAM</td> <td>Prints a full dump following abnormal job termination <u>only</u> if the executing program specifies a dump and if a dump is specified for that job class (consult the <u>VS System Operator's Reference</u>).</td> </tr> </table> No dump, indicative or full, is printed if the specified job procedure is nonexistent or is currently in use in I/O mode.	Y	YES	Prints a full program dump following abnormal job termination.	N	NO	Does not print a full dump following abnormal job termination.	P	DEFAULT PROGRAM	Prints a full dump following abnormal job termination <u>only</u> if the executing program specifies a dump and if a dump is specified for that job class (consult the <u>VS System Operator's Reference</u>).
Y	YES	Prints a full program dump following abnormal job termination.								
N	NO	Does not print a full dump following abnormal job termination.								
P	DEFAULT PROGRAM	Prints a full dump following abnormal job termination <u>only</u> if the executing program specifies a dump and if a dump is specified for that job class (consult the <u>VS System Operator's Reference</u>).								

CPU LIMIT	An optional CPU time limit for job execution. If this limit is exceeded, the specified ACTION is performed.		
ACTION	The system takes this action when the CPU LIMIT is exceeded:		
	C	CANCEL	Automatically cancels the procedure.
	W	WARN	Sends a message to the Operator's Console informing the operator that the job has exceeded its time limit, and continues processing the job.
	P	PAUSE	Suspends execution of the job and sends a message to the Operator's Console informing the operator that the job has exceeded its time limit.

For more information, refer to Section 3.7.2, "Controlling the Procedure Queue."

3.15 SEND MESSAGE TO OPERATOR

Send MESSAGE To Operator is a broadcast facility that allows a workstation message to be sent between an Operator's Console and user workstations. Both Operator-to-User and User-to-Operator facilities are available.

The Operator-to-User Message facility allows an operator to send a one-line message to either the workstations of all users or the workstation of one specific user. The message is displayed on the Command Processor menu, the Modified Command Processor menu, the Logon screen, and the Logon Inhibited screen. An option is available that forces user(s) in DP mode to the Command Processor in order to immediately display the message. On those workstations that are HELP-suppressed, the Command Processor menu is displayed with only PF1 (Continue) as an option. The Operator-to-user Message facility is described in detail in the VS System Operator's Reference.

The User-to-Operator Message facility allows a user to send a one-line message to all workstations in Operator mode. The message is displayed immediately as a normal Operator message. The message contains the User ID of the sender and the time that the message was sent.

Access the User-To-Operator Message facility by pressing PF13 (Send Message To Operator) from the Command Processor menu or the Modified Command Processor menu. The screen shown in Figure 3-27 is displayed.

*** Send A Message To All Operators ***
1:30 pm Wednesday July 6, 1983

Supply Below The Message To Be Sent:

PLEASE MOUNT DISK VOL300*****

Press (ENTER) To Send Message, or Press (HELP) to Return to
Command Processor Menu

Figure 3-27. User-to-Operator Message Screen

You must supply the text of the message, which can contain up to 56 characters. When you press ENTER, the message is shown immediately as a normal Operator message on all workstations in Operator mode. The message displayed contains the User ID of the sender as well as the time of the message. Press HELP to return to the Command Processor menu. To remove the message, the operator positions the cursor next to the message line and presses ENTER.

3.16 PRINT PROGRAM SCREEN

The PRINT Program Screen command is associated with PF14 on the Modified Command Processor menu. It prints the contents of the program screen displayed when the current program was interrupted. To print a specific program screen while the program is executing, press HELP while that screen is displayed (this accesses the Modified Command Processor menu), and then press PF14. Press PF1 to return to the program (CONTINUE Processing).

3.17 PRINT COMMAND SCREEN

The PRINT Command Screen command is associated with PF15 on both Command Processor menus. It prints the contents of any screen displayed by the Command Processor (that is, it does not print screens displayed from the RUN command). The PRINT Command Screen command is unique because you can issue it by pressing PF15 even when the Command Processor menu is not displayed.

Whenever you issue this command, it immediately attempts to print (it creates a print file containing the current screen display). If the print mode is on-line and the assigned printer is not available, PRINT Command Screen does not execute, and the workstation audio alarm sounds.

3.18 LOGOFF

The LOGOFF command is associated with PF16 on the Main Command Processor menu. It logs you off the system. When you press PF16, a message is displayed telling you that you are terminating your current session. It also tells you to press ENTER to complete the Logoff operation, or to press HELP to return to the Command Processor. If you press ENTER and log off the system, you must repeat the Logon procedure to regain access to the system.

3.19 CANCEL PROCESSING

The CANCEL Processing command is associated with PF16 on the Modified Command Processor menu. This command closes all open files used by the interrupted program and scratches any work files associated with it. When you press PF16, a screen is displayed telling you that you are terminating your current program. This screen also instructs you to press ENTER to initiate the CANCEL Processing operation, press PF1 to return to debug processing, or press HELP to return to the Modified Command Processor menu. If you press ENTER when CANCEL Processing completes execution, you return to the Main Command Processor menu, and a message is displayed acknowledging that you cancelled the program.

NOTE

Cancellation is not recommended while production files are being modified. CANCEL Processing guarantees that the file attributes, as recorded in the Volume Table of Contents, are consistent with the file contents at the time the program is cancelled. However, CANCEL Processing does not prevent problems with processing synchronization that may be caused by partially updated file contents.

CHAPTER 4

VS INFO ON-LINE HELP AND INFORMATION FACILITY

4.1 INTRODUCTION

VS INFO is an information facility for interactively perusing on-line manuals and other documentation including on-line help text. This documentation consists of how-to procedures for specific software functions and reference information on the VS itself. VS INFO is a software facility designed to access this on-line documentation. VS INFO is also used by some Wang software products to display relevant help text. This feature allows you to refer directly to VS INFO documentation concerning a program function while running the program. VS INFO also has its own help text, available on-line while you are running INFO.

INFO features a full screen display or split-screen display with which you can display simultaneously a table of contents and the corresponding text. You can view the contents of a document sequentially, and locate specific text references or sections within the document by scrolling the text forward and backward. INFO provides a "place-marker" to mark a section you are currently viewing so that you can return to that location in the text after following up references to other sections.

4.2 RUNNING VS INFO

You can run VS INFO interactively from the Command Processor by pressing PF1 and entering the program name INFO. At present, certain Wang software products allow you to access VS INFO during a program by pressing PF key 13. The following paragraphs describe the procedure for using the facility.

4.2.1 Topic Selection

Once VS INFO is running, the first screen to appear is the Topic Selection menu (see Figure 4-1). This menu displays the titles of all topics that are currently contained in the topic directory file. The topic directory file is contained in the VS INFO library. From the Topic Selection menu, you can invoke all available VS INFO functions.

To access a document, you can either type in the entire title or unique prefix of a document (in the space provided at the top of the screen) and press ENTER, or position the cursor (via TAB) beside the selected document in the topic list and press ENTER. A unique prefix must clearly define a specific topic heading. For example, if the topics PROC and PROCEDURE are listed, use a distinctive prefix. In this case, PROC is a unique prefix for the PROC topic and PROCE is unique for PROCEDURE. Once you press ENTER, the Display Mode screen is entered.

```

*** Wang VS Online Information ***

Topic Selection Menu

Enter a Topic name (or unique prefix): VS*INFO*****
Or position the cursor to one of the following topics:

    * VS BASIC Language Reference
    * VS COBOL Reference
    * VS INFO - Help Text
    * VS PL/I Language Reference
    * VS Procedure Language Reference
    * VS System Utilities Reference

And press (ENTER) to display information on the topic or select:
(1) Return
(2) First (4) Previous (6) Down (13) Help
(3) Last (5) Next (7) Up (10) Special Functions (16) Exit

```

Figure 4-1. The Topic Selection Menu

The Topic Selection menu provides the following PF key options:

<u>PF Key</u>	<u>Option</u>	<u>Action</u>
ENTER	Continue	Displays the Display Mode screen (see Section 4.2.2).
1	Return	Exits VS INFO.
2	First	Positions to the beginning of the topic directory.

<u>PF Key</u>	<u>Option</u>	<u>Action</u>
3	Last	Positions to the end of the topic directory.
4	Prev	Displays the previous set of topic titles.
5	Next	Displays the next set of topic titles.
6	Down	Moves the topic directory downware one line. The bottom line disappears and a new line appears at the top.
7	Up	Moves the topic directory upward one line. The top line disappears and a new line appears at the bottom.
10	Special Functions	Accesses the VS INFO Special Function menu (see Section 4.).
13	Help	Displays help on VS INFO topic selection.
16	Exit	Terminates VS INFO processing.

4.2.2 Displaying Manuals

The Display Mode screen, shown in Figure 4-2, enables you to view an on-line manual. The screen is divided into the following five areas:

Title. The first line on the screen shows the topic title you selected from the Topic Selection menu.

Table of Contents. The second area on the screen is the table of contents window. It shows the table of contents for the topic you selected.

You can scroll through the table of contents by positioning the cursor inside the window and using the scrolling PF keys.

You can display a particular section in the text by positioning the cursor to the section title and pressing ENTER.

Text. The third area on the screen is the text window. It shows the text for the section that is highlighted in the table of contents window (if present).

You can scroll through the text by positioning the cursor inside the window and using the scrolling PF keys.

You can automatically position both the table of contents and text windows to another section in the text by positioning the cursor at a section reference and pressing ENTER.

PF Keys. The Display Mode screen provides 13 PF key options, listed below.

Keys (2) through (7) affect scrolling and paging in the table of contents and text windows. If both windows are visible, you can select one by cursor positioning. If the cursor is not in a window, the text window is automatically selected. If only one window is visible, that window is automatically selected.

The table of contents window changes whenever scrolling or paging in the text causes a new section to be entered. The current section number and title are highlighted. The text from this section appears on the first line in the text window.

*** Wang VS Info for VS INFO On-line Information and Help Facility ***			
1.1	VS INFO ON-LINE HELP AND INFORMATION FACILITY		
1.1.1	Running VS INFO		
1.1.2	Topic Selection		
1.1.3	Display Mode		
1.1.4	Special Functions		
1.1	<u>VS INFO ON-LINE HELP AND INFORMATION FACILITY</u>		
 VS INFO is an information facility for interactively perusing on-line manuals and other documentation including on-line help text. This documentation consists of how-to procedures for specific software functions and reference information on the VS itself. VS INFO is a software facility designed to access this on-line documentation. VS INFO is also used by some Wang software products to display relevant help text. This feature allows you to refer directly to VS INFO documentation concerning a program function while running the program. VS INFO also has its own help text, available on-line while you are running INFO.			
<u>Position cursor and press (ENTER) to locate a section or topic, or Select:</u>			
(1) Return to Topic Menu	(8) Find		
(2) First (4) Prev (6) Down	(9) Full Screen	(11) Text	(13) Help
(3) Last (5) Next (7) Up	(10) Table of Contents		(16) Exit

Figure 4-2. The Display Mode Screen (Split Screen Mode)

<u>PF Key</u>	<u>Option</u>	<u>Action</u>
ENTER	Continue	Position the cursor anywhere in the table of contents window and press ENTER. You can view the section contents in the text window. Positioning the cursor anywhere in the text window and press ENTER. You can view the contents of the referenced section. In both cases, the table of contents window is updated accordingly, and the new section title is highlighted.
1	Return	Returns to the Topic Selection menu. If you positioned to another section using some method other than scrolling, pressing PF1 returns you to the previous section. Whenever you return to a section using PF1, the text window is positioned exactly as it was when you left the section. This is similar to placing a bookmark in the previous section.
2	First	Positions the cursor inside the table of contents window. Press PF2 to access the beginning of the contents, or Position the cursor inside the text window. Press PF2 to display the beginning of the text for the highlighted section.
3	Last	Position the cursor inside the table of contents window. Press PF3 to access the last portion of the contents, or Position the cursor inside the text window. Press PF3 to display the end of the text for the highlighted section.
4	Prev	Select a window by positioning the cursor inside it. Press PF4 to display the previous set of lines in the window. Two lines from the top of the previous window are displayed at the bottom of the window for orientation purposes.

<u>PF Key</u>	<u>Option</u>	<u>Action</u>
5	Next	Select a window by positioning the cursor inside it. Press PF5 to display the previous set of lines in the window. Two lines from the bottom of the previous window are displayed at the top of the window for orientation purposes.
6	Down	Select a window by positioning the cursor inside it. Press PF6 to move the contents of the window downward one line. The bottom line disappears from the window and a new line appears at the top of the window.
7	Up	Select a window by positioning the cursor inside it. Press PF7 to move the contents of the window upward one line. The top line disappears from the window and a new line appears at the bottom of the window.
8	Find	Locates sections and strings. If the search is not successful, a message is displayed and the window retains the position it had before the search began.

Finding a section. Enter the number of the section or a word or phrase from the section title in the Find prompt area. Position the cursor inside the table of contents window where you want the search to begin. Then press PF8. If the search is successful, the section number and title are positioned at the beginning of the text in the section.

Finding a string. Enter an unquoted string in the Find prompt area. Position the cursor inside the table of contents window or the text window where you want the search to begin. Then Press PF8. If the search is successful, the cursor is positioned where the text string was found. The next occurrence of the string can easily be found by pressing PF8 again.

<u>PF Key</u>	<u>Option</u>	<u>Action</u>
9	Full Screen	Position the cursor inside either window and press PF9. The size of the selected window increases to 18 lines. The other window is not visible.
9	Split	In full screen mode, pressing PF9 displays both windows again.
10	Table of Contents	Displays the table of contents in the expanded window in full screen mode. In split screen mode, the cursor is positioned at the top left of the table of contents window.
11	Text	Displays the text in the expanded window in full screen mode. In split screen mode, the cursor is positioned at the top left of the text window.
13	Help	Displays help on VS INFO on-line manual display functions.
16	Exit	Exits immediately from the topic and returns to the Topic Selection menu. From that menu, you can select any topic or press ENTER to display the on-line manual for the current topic.

Other Functions

You can use the HOME, TAB, and BACKTAB keys to position the cursor in the table of contents or text window. The first line in each window is a tab field. Pressing the HOME key selects the upper window and pressing the TAB key selects the lower window (if present).

If you are reading the text and see a section reference such as:

... for more details see Section 5.0

you can position to that section by placing the cursor anywhere within the section number (e.g., the "5") and pressing ENTER. You can return to the section you were reading by pressing PF1.

Message

The bottom line on the screen is reserved for displaying any error messages.

4.2.3 Special Functions

After you press PF10 from the Topic Selection menu, the Special Function menu is displayed, shown in Figure 4-3. The Special Function menu enables you to attach alternate topic libraries to VS INFO or regenerate the topic directory file.

*** Wang VS On-Line Information ***

Special Function Menu

Enter alternate topic library information:

LIBRARY = @DOCLIB@ VOLUME = SYSTEM

And press (ENTER) to use that topic library or select:

(1) Return

(4) Regenerate topic directory file.

(13) Help on special functions.

(16) Return to topic selection menu.

Figure 4-3. The Special Function Menu

The following advanced functions are available:

Access an alternate topic library. Fill in the LIBRARY and VOLUME names where alternate topics reside and press ENTER. Default library and volume names refer to the system topic library. A blank LIBRARY entry reverts to this default.

Regenerate directory. Press PF4 to regenerate the topic directory only when files in the topic library have been changed. The system topic library is the default. It contains VS INFO copies of the topics listed on the Topic Selection menu.

The Special Function menu also provides the following PF key options:

<u>PF Key</u>	<u>Option</u>	<u>Action</u>
1	Return	Returns to the Topic Selection menu.
13	Help	Displays help on VS INFO special functions.
16	Return to topic selection menu	Returns to the Topic Selection menu.

APPENDIX A
WORKSTATION CHARACTER SET

NOTE: <i>b₇ always equals zero*.</i>					b ₆ →	0	0	0	0	1	1	1	1
					b ₅ →	0	0	1	1	0	0	1	1
					b ₄ →	0	1	0	1	0	1	0	1
					High-Order Digit →	0	1	2	3	4	5	6	7
b ₃ ↓	b ₂ ↓	b ₁ ↓	b ₀ ↓	Low-Order Digit ↓									
0	0	0	0	0			â	SP	0	@	P	•	p
0	0	0	1	1		◆	ê	!	1	A	Q	a	q
0	0	1	0	2		►	î	"	2	B	R	b	r
0	0	1	1	3		◄	ô	#	3	C	S	c	s
0	1	0	0	4		→	û	\$	4	D	T	d	t
0	1	0	1	5		—	ä	%	5	E	U	e	u
0	1	1	0	6			ë	&	6	F	V	f	v
0	1	1	1	7		..	ï	,	7	G	W	g	w
1	0	0	0	8		/	ö	(	8	H	X	h	x
1	0	0	1	9		\	ü	)	9	I	Y	i	y
1	0	1	0	A		^	à	*	:	J	Z	j	z
1	0	1	1	B		■	è	+	;	K	[	k	\$
1	1	0	0	C		!!	ù	,	<	L	\	l	£
1	1	0	1	D		†	Ä	-	=	M	]	m	é
1	1	1	0	E		ß	Ö	.	>	N	↑	n	§
1	1	1	1	F		¶	Ü	/	?	O	←	o	¢

*Bit combinations 10000000 through 11111111 are field attribute characters.

APPENDIX B

COMMON DECIMAL DATA FORMATS

There are three types of decimal representations commonly used by the VS.

B.1 EXTERNAL DECIMAL

External decimal is also referred to as free-form ASCII. External decimal characters (the numbers, 0-9, the signs, + and -, and the decimal point) are each represented in one byte. Each digit is represented by its ASCII digit. The sign, if supplied, is either the leading or trailing byte. The decimal point, represented in one byte, is positioned within the external decimal format.

External decimal items cannot be directly used in computation. The PAL (pack and align) Assembler instruction converts an external decimal to a packed decimal format which can be used in computation. COBOL performs this instruction automatically on any external decimal field used in an arithmetic operation. The external format string for any field which is to be converted to a packed format field cannot exceed 16 ASCII characters.

B.2 ZONED DECIMAL

Each digit of a zoned decimal number is represented by a single byte. The four high-order bits of each byte are zone bits; the four high-order bits of the least significant byte represent the sign of the item. The four low-order bits of each byte contain the value of the digit.

Zoned decimal items cannot be directly used in computation. The PACK Assembler instruction converts a zoned decimal to a packed decimal format which can be used in computation. COBOL performs this instruction automatically on any zoned decimal field used in an arithmetic operation. The maximum length of a zoned decimal item is 18 digits.

B.3 PACKED DECIMAL

All decimal arithmetic is performed on data in packed format.

In packed format, two decimal digits are placed adjacently in a byte except for the rightmost byte of the field. A sign is placed in the four low-order bits of this least significant byte. Both digit and sign are represented by four bits each.

The external length of a packed decimal may contain up to 31 digits and a sign.

Sample Representations of Data Formats

Decimal Format	External Value	ASCII Internal Representation	Internal Length	External Length
Zoned	123	31 32 F3	3	4
	+123	31 32 F3	3	4
	123+	31 32 F3	3	4
	123-	31 32 D3	3	4
	.123	31 32 F3	3	5
	-.123	31 32 D3	3	5
	.123-	31 32 D3	3	5
Packed	123	12 3F	2	4
	+123	12 3F	2	4
	123+	12 3F	2	4
	123-	12 3D	2	4
	.123	12 3F	2	5
	-.123	12 3D	2	5
	.123-	12 3D	2	5
External	123	31 32 33	3	3
	+123	2B 31 32 33	4	4
	123+	31 32 33 2B	4	4
	123-	31 32 33 2D	4	4
	.123	2E 31 32 33	5	5
	-.123	2D 46 31 32 33	5	5
	.123-	2E 31 32 33 2D	5	5

APPENDIX C
VS NAMING CONVENTIONS

C.1 SYSTEM NAMING CONVENTIONS

There are several types of files and/or libraries named automatically or by default by the system. These conventions are listed below.

File or Library	Type	Algorithm	Example
Work Libraries*	System User (Interactive) User (Background)	@SYSWORK # + User ID + WORK # + Task Number + WORK	@SYSWORK #SFKPRT #015WORK
Work Files	System User	@SYS + Segment Number + Task Number (The Segment number is a one-digit number of value 0, 1, or 2.) 1st 4 char. of Prog. ID + 4-digit sequence number	@SYS215 EDIT0001
Print Libraries	System User	#PRT # + User ID + PRT	#PRT #SFKPRT
Print Files	System @SYS0002 User	@SYS + 4-digit sequence num. 1st 4 char. of Prog. ID + 4-digit sequence number	 EDIT0003
I/O Error Log	System (file is in @SYSWORK)	@SYSLOG	@SYSLOG
Printer/ Backgrnd. Queues	System (file is in @SYSWORK)	QUEUE	QUEUE
Temporary Files	Compilers LINKER	## + TEST ## + TEMP	##TEST ##TEMP
* Note that no permanent files should be placed into a work library, because work libraries are scratched when returning to the Comand Processor.			

In addition to the system conventions listed above, there are two file types identified by naming conventions used both by the system and the user. These two file types are recognized by DMS and are accorded special treatment. They are the two types of temporary files, which are used by system programs (such as the language compilers and the Linker) as well as by users during program testing. These two naming conventions are as follows:

File Type	Algorithm	Example	Comments
Work	# + up to 7 char.	#TEST	File is scratched upon closing.
Temporary	## + up to 6 char.	##TEST	File is scratched upon return to the Command Processor Menu.

C.2 SUGGESTED USER NAMING CONVENTIONS

Certain user-created libraries on the VS are named by their users for the types of files they contain. Some of the VS utilities, such as the File Management Utilities, use these conventions as well. This technique of library naming permits you to group related types of files, such as data files, in one library. Additionally, this facility enables you to assign the same file name to two related files, and place them into separate identifying libraries. For example, the source and object files for the same program may be given the same file name, but assigned to separate libraries for source and object programs. The common conventions used on the VS, such as the ones mentioned above, are listed below:

Library Type	Algorithm	Example (User SFK)
Data	ID + DATA	SFKDATA
Source Code	ID + SRCE	SFKSRCE
Object Code	ID + OBJ ID + PROG	SFKOBJ SFKPROG
Procedures	ID + PROC	SFKPROC
Test	ID + TEST ID + JUNK	SFKTEST SFKJUNK

GLOSSARY

Address. A character or group of characters that identifies a register, a particular position in storage, or some other data source or destination.

Alphanumeric characters. A character set that contains letters, digits and a set of special characters (i.e., \$, or #).

ANSI. American National Standards Institute.

ASCII. American Standard Code for Information Interchange. A standard set of codes used to represent characters within a computer.

Assistance ID (AID). A special control character generated by a system communication key (HELP, PF key, or ENTER), which identifies the key used to initiate a program interrupt.

Background processing. A time-independent, noninteractive processing environment that consists of one or more programs and procedures run without user intervention by a controlling procedure.

Binary. A number system based on two, using the digits 0 and 1.

Bit. A single binary digit, 0 or 1.

Block. A number of physical records, each 2048 (2K) bytes in length, which make up a disk volume.

Buffer. A temporary storage area in the system for input or output information before it is transferred to a storage or output device.

Byte. A sequence of adjacent binary digits, usually eight bits, operated on as the smallest addressable unit; synonymous with character.

Cancel PROCESSING command. A command associated with PF16 on the Modified Command Processor menu, which closes all open files used by the interrupted program and scratches any work files associated with it.

Character. Any letter of the alphabet, any digit 0 through 9, or designated special character. See Byte.

Command Processor. The menu that contains descriptions of the available system commands and associates each command with one of the Program Function (PF) keys on the workstation keyboard.

Compiler. The area of the system which translates a higher-level set of instructions, or program code, into machine-readable form.

Configuration. The total system, comprised of the CPU, CRT/keyboard, printer and storage media.

CONTINUE Processing command. Resumes program execution from the point of interruption; associated with PF1 on the Modified Command Processor menu.

CPU. The unit of the VS that controls the interpretation and execution of instructions. The CPU also monitors the use of main memory and input/output operations.

CRT (Cathode Ray Tube). The video portion, or screen, of the VS workstation that displays information (24 rows of 80 characters) as it is entered from the keyboard, recalled from storage, or edited.

Cursor. A special symbol resembling a blinking, double underscore that indicates where the next character entered from the keyboard will be displayed on the CRT.

Cursor-Positioning key. A key used to move the cursor to a desired location on the CRT.

Data Entry key. A key that provides the means for entering data at the current cursor position on the CRT.

Data Management System (DMS). A component of the VS Operating System which handles file maintenance and space allocation on external storage devices. DMS performs all input/output operations to external devices, and controls the physical location of information on each volume.

Default. A preset value assigned by the system and given a unique name, if you do not enter a value (i.e., system disk).

Diskette. A flat, magnetic storage medium that is removable from its drive and used for off-line storage of information. Also known as a floppy diskette.

Disk volume. A flat circular plate with a magnetizable surface on which information can be stored, and retrieved by random access. Also known as hard disk or disk platter, a disk volume is divided into a number of blocks, and contains a label that holds the volume name, and a Volume Table of Contents (VTOC).

Display mode. The means by which you view an on-line document in the VS INFO facility.

Dual mode. A workstation mode that provides both user mode and operator mode facilities. (See User Mode, and Operator Mode.)

Enter DEBUG PROCESSING command. A command associated with PF10 on the Modified Command Processor menu. This command initiates debug processing, which allows you to inspect the program and its associated data and status information, and to perform a variety of debugging operations.

ENTER key. The key used to terminate user entry and request the program to process data.

Enter OPERATOR MODE command. A command associated with PF11 on both Command Processors if you have a dual mode workstation. This command displays the Operator's Console menu, which makes all operator functions available.

Enter WORD PROCESSING command. A command that runs word processing on the VS directly from the Main Command Processor menu (using PF9).

Extent. A group of contiguous blocks on the system volume, allocated by the system for use by a particular file. Up to 13 extents are allocated to one file.

Field. A discrete region of the CRT which may be assigned specific attributes (i.e., protected, modifiable, or blinking).

Field Attribute Characters (FACs). Special field control characters used to define protected, modifiable, or blinking fields on the CRT.

File. A logical unit consisting of zero or more records of related information; assigned an alphanumeric name, containing up to eight characters. The file name must begin with an alphabetic character, integer, @, \$, or #, and contain no embedded spaces. (See individual file types.)

File Class. A file protection system provided by the VS to which individual program and data files can be assigned. A file class is designated by a one-character file class protection code.

Free Extent. A group of contiguous blocks on a disk volume that is not allocated to any file.

Interactive Processing. The manner in which you can communicate with the system through your workstation by responding to system prompts displayed on the CRT, or controlling the system by entering information from the keyboard.

HELP key. The key that invokes the Command Processor menu on the workstation, or the Modified Command Processor menu during program interruption.

Hexidecimal. A numbering system using the digits 0-9 and the letters a-f; based on the power of 16. Also known as hex.

Library. A collection of files, usually of related contents; assigned an alphanumeric name, containing up to eight characters. The library name must begin with an alphabetic character, @, \$, or #, and contain no embedded spaces. (See individual library types.)

Logical Mount. Notification to the system software that a new disk has been placed on the disk drive; allows the system to read the new volume's catalog in order to access the information on the disk.

LOGOFF command. A command associated with PF16 on the Command Processor menu, which logs you off the system.

LOGON command. The first display encountered at a workstation after entering your User ID and password.

Manage DEVICES command. Allows you to view the current information about the status of all the peripheral devices on the system, and allows you to mount and dismount disks and tapes. This command is associated with PF6 on both Command Processor menus.

Manage FILES/LIBRARIES command. A command associated with PF5 on both Command Processor menus, which allows you to inspect and modify the contents of on-line volumes. This command provides the names of currently mounted volumes, libraries contained in each volume, the names and attributes of files contained in each library, and the free extents on any volume.

Manage QUEUES command. A command associated with PF4 on both Command Processor menus, which displays and controls the print and procedure queues, and file transfer transmit and retrieve queues.

Manage COMMUNICATIONS command. A command associated with PF8 on both Command Processor menus that provides information about all telecommunication (TC) units configured for the system including all remote devices connected by telecommunication lines.

Menu. A list of available options displayed on the CRT when the system is turned on or after an operation has been completed.

Modified Command Processor. The menu that permits continuation of program execution or cancellation of the program. It allows selection of most of the commands available in the Main menu of the Command Processor, and includes additional commands.

Numeric characters. The characters set containing the numbers 0 through 9.

Object code. Executable machine code output from a compiler or assembler.

Object files. Files containing executable machine code.

Object program. Executable machine code translated from a compiler program (source language) so that the program can be processed by the VS.

Off-line or external storage. Storage that supplements main memory and can be removed from the system (i.e., diskette), but is not accessible to main memory.

Operating system. The software that controls the execution of programs, and can provide scheduling, debugging, input/output control, compilation, storage assignment, and related services.

Operator mode. A workstation mode that provides access to facilities used for system monitoring and control by an operator.

Page. A block of instructions, data, or both that can be transferred between real storage and auxiliary storage.

Page-in/Page-out. A time sharing technique in which virtual memory moves page segments of both system and user programs into and out of memory.

Print Class (PRTCLASS). The default print class (A-Z) to which print files are assigned. Each printer is assigned certain print classes, so a file's print class determines which printers can print it.

Print COMMAND SCREEN command. A command that prints the contents of any screen displayed by the Command Processor, even when the Command Processor menu is not displayed. This command is associated with PF15 on both Command Processor menus.

Print Files. Disk files that contain the output sent to a printer by a program, and usually stored, by default, in your print library. Any print output sent to disk is stored in a print file.

Print Mode. The manner in which print output is handled by the system. The print mode is assigned to that output when it is created. Print mode types include Hold, Spool, Keep, and On-line.

Print PROGRAM SCREEN command. A command associated with PF14 on the Modified Command Processor menu, which prints the contents of the program screen displayed when the current program was interrupted.

Print Queue. A table of files that lists all print files controlled by the spooling system. The print queue also displays several characteristics of each listed print file, and offers certain manipulation options.

Procedure. A set of commands written in the VS Procedure Language which provide the means to perform a number of system operations and supply required parameters to programs with little or no user intervention; essential for running background jobs.

Procedure queue. A list of all background jobs submitted for processing, including specific information concerning each submitted job.

Program Function key (PF key). One of 16, all of which act the same as the ENTER key, except that each key generates a unique character or executes an associated command (i.e., from the Command Processor).

Pseudoblack. A blank character, represented on the CRT as a solid block.

Queue. A collection of files waiting for sequential processing by a printer or other device.

Random access. A quick method of accessing records in a file in any order on a storage medium, using a pre-arranged pattern to create the most direct route to that information.

Record. A collection of words, 2048 or 2K bytes long.

RUN Program or Procedure command. Runs a user or system program or procedure; this command also loads a program for interactive debugging. This command is associated with PF1 on the Main Command Processor menu.

Send MESSAGE To Operator. A command associated with PF13 on both Command Processor menus that allows a workstation message to be sent between an Operator's Console and user workstations.

SET Usage Constants command. A command associated with PF2 on both Command Processor menus which allows specification of default names for certain commonly used libraries and volumes. This commands also permits the specification of a default file protection class, various print mode options, and certain background job submittal parameters.

SHOW Program Completion Report command. Shows specific information about the program or procedure just completed by the system, including the name of the program, total elapsed and CPU times, total input/output operations performed, and total page-ins and page-outs required by the system and program. This command is associated with PF3 on both Command Processor menus.

SHOW Program Status command. A command associated with PF3 on the Modified Command Processor menu and displays information about the interrupted program or procedure, including the name and location of the program and active subprogram (if any), total elapsed and CPU times, total input/output operations, and total page-ins and page-outs required by the system and program before interruption.

Source code. Program statements written in a source, or programmer readable, language. The code is compiled into machine-readable form before it can be used by the system.

Special Function menu. A menu provided by the VS INFO facility, which enables you to attach alternate topic libraries to VS INFO or regenerate the topic directory file contained in the topic selection menu.

Special-Purpose key. One of three keys (SHIFT, LOCK, and RESET) used for special, noncategorized actions.

Spooling. The use of auxiliary storage as a buffer storage to reduce processing delays when transferring information between peripheral equipment (i.e., printer) and the system processors.

Submit PROCEDURE command. A command associated with PF12 on both Command Processor menus, which submits a job for background processing on the VS.

System Communication key. One of three special keys (ENTER, PF key, HELP) that enables you to communicate interactively with the system, begin processing of data entered into the system, or request assistance from the system.

System Program Library. Contains system programs and resides on the system volume. The System Program Library and Volume are used automatically as defaults by the RUN command when the named program cannot be found in the specified user library and when no other library name is supplied.

System User List. A list kept by the system which identifies all users who have access rights to the system.

Tape Volume. A storage medium of magnetic tape that supports only sequential file organization. A tape volume can contain a tape label, and header/trailer markers for each file. The VS supports IBM-labeled, ANSI-labeled, and nonlabeled tapes.

Telecommunications. The transmission and reception of information over telephone lines.

Topic Selection menu. A menu that displays the titles of all documents currently attached to the VS INFO facility.

User ID and Password. Assigned to each user by a system security administrator as unique identification, to obtain access to the system.

User Mode. A workstation mode that permits access to the system's Command Processor menu for program development, execution and debugging.

Utility program. A program in general support of the processors of the system (i.e., copying information from one storage device to another).

Virtual Memory. A term used to describe the use of disk storage as an extension of main memory.

Volume. An independent storage device (i.e., disk, tape) containing a collection of libraries; assigned an alphanumeric name containing up to six characters. A volume name must begin with either an alphabetic character, integer, @, \$, or #, and contain no embedded spaces. (See individual volume types.)

Volume Table of Contents (VTOC). An internal system device that resides on a disk volume and contains a listing of the names, locations, and attributes of all files on the volume and the libraries to which the files are assigned.

VS INFO. A software facility designed to access documentation consisting of how-to procedures for specific software functions and reference information on the VS itself.

Word. A group of bytes, stored and addressable as one unit. Four bytes make up a word on the VS.

Word Processing. A method of document preparation, characterized by its ability to store documents on a storage medium to permit subsequent access for quick, easy editing and payout.

Work Files. Temporary disk files used by the system during program editing, compilation, and execution. Work files are created, named, and deleted after use by the operating system. The system supplies the work file's name.

Work Libraries. A collection of work files. Two possible work libraries are available for each user: one for interactive processing, and one for noninteractive background processing. The system supplies the work library's name.

Workstation. A component of the system consisting of a CRT and keyboard at which a programmer enters and edits information (i.e., a program). The workstation works in conjunction with the CPU, printer, and other peripherals.

DOCUMENT HISTORY

SUMMARY OF CHANGES FOR THE 5TH EDITION OF THE VS PROGRAMMER'S INTRODUCTION

TOPIC	DESCRIPTION	PAGES
Spooling	Now includes spooling to remote devices.	1-15
Command Processor	The Command Processor menus have been slightly changed to account for the following commands:	3-1
Enter WORD PROCESSING	This Main menu option lets you enter Word Processing mode directly from the Command Processor, if you have the Word Processing software package and a combined workstation.	3-39
Mount/Dismount Volumes	This option was previously a Command Processor menu command. It is now available through the Manage DEVICES command associated with PF6 on the Command Processor menu.	3-29, 3-34
Show Device Status	This option was previously a Command Processor menu command. It is now available through the Manage DEVICES command associated with PF6 on the Command Processor menu.	3-26, 3-28, 3-33
Control Print/Job Queues	This Command Processor option was previously available through PF11. It is now available through PF4 - Manage Print/Procedure Queues.	3-15

TOPIC	DESCRIPTION	PAGES
Device Management	The new Manage DEVICES command, associated with PF6 on the Command Processor menu, allows you to view status information about all the peripheral devices on the system and to mount, dismount, and perform other device management functions.	3-15
EDITOR LINKER Debug facility EZ languages GETPARMs Return Codes	Now documented in <u>VS Program Development Tools Reference</u> .	

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